NAME: ……

CLASS: ……

PHYSICS
PAPER 2
PREDICT 2013
SMK MERBAU MIRI SARAWAK

STRUCTURES, ESSAYS (LIMITED AND OPEN RESPONSES)

PAPER 2 PREDICT

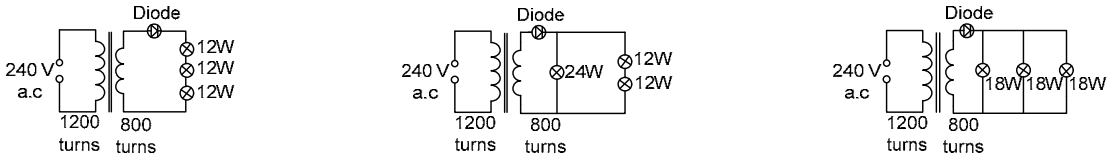
PHYSICS 2013

SMK MERBAU MIRI SARAWAK

QUESTION 1 TRANSFORMER

1 Diagram 1 shows three transformers X, Y and Z. Each transformer has its own specific number of turns of primary and secondary coils respectively. Each transformer is connected to 240 V alternating current suppliers. The output for each transformer is connected to electric filament bulbs in different arrangement.

Rajah 1 menunjukkan tiga transformer, X, Y dan Z. Setiap transformer mempunyai spesifikasi bilangan gegelung primer dan sekunder masing-masing. Setiap transformer disambungkan kepada 240 V bekalan arus ulangalik. Output bagi setiap transformer disambungkan kepada mentol-mentol filament dalam cara sambungan yang berbeza.



Transformer X | Transformer Y | Transformer Z

Diagram 1 / *Rajah 1*

(a) **(i)** What is ideal *transformer* / *Apakah itu transformer unggul*? [1 marks / *markah*]

.....

(ii) State the type of transformer used in Diagram 1. [1 mark / *markah*]
Nyatakan jenis transformer yang digunakan dalam Rajah 1.

.....

(iii) State one reason why the a.c. voltage is supplied. [1 mark / *markah*]
Nyatakan satu sebab mengapa voltan a.u dibekalkan?

.....

(b) State the principle involved for transformer. [1 mark / *markah*]
Nyatakan prinsip yang terlibat untuk transformer.

.....

(c) Explain the working principle for transformer. [5 marks / *markah*]
Terangkan prinsip kerja untuk transformer.

.....

.....

.....

(d) State the function of diode in the circuit. [1 mark / *markah*]
Nyatakan fungsi diod dalam litar.

.....

(e) All the transformers are the same and produce the same output voltage.
Calculate output voltage for the transformers. [2 marks / *markah*]
Kesemua transformer adalah sama dan menghasilkan voltan output yang sama.
Kirakan voltan output bagi transformer-transformer.

(f) When the switch is on, 0.25 A current flows through the primary coil in each transformer. All the bulbs lights up normally.
Apabila suis dihidupkan, arus 0.25 A mengalir melalui gegelung primer dalam setiap transformer. Kesemua mentol menyala secara normal.

(i) Calculate the input power for each transformer. [2 marks / *markah*]
Hitung kuasa input bagi setiap transformer.

.....

(ii) Determine the output power for each transformer. [3 marks / *markah*]
Tentukan kuasa output bagi setiap transformer.

.....

(iii) Between transformer X, Y and Z, which one has the highest efficiency? [1 mark / *markah*]
Antara transformer X, Y dan Z, yang manakah mempunyai kecekapan tertinggi?

.....

(iv) Give a reason for your answer in **1**(f)(iii). [1 mark / *markah*]
*Berikan satu sebab untuk jawapan anda di **1**(f)(iii).*

.....

1 **(g)** **(i)** If the transformers are ideal, what is the output power? [1 mark / *markah*]
Jika transformer-transformer adalah unggul, berapakah kuasa outputnya?

.....

(ii) State one reason why the efficiency of the transformer is less than 100%. [1 mark / *markah*]
Nyatakan satu sebab mengapa kecekapan transformer adalah kurang daripada 100%?

.....

(iii) State one step to overcome the problem in **1**(g)(ii) above. [1 mark / *markah*]
Nyatakan satu cara untuk mengatasi masalah di dalam 1(g)(ii) atas.

.....

(h) A student wants to build a simple transformer. Table 1 shows the characteristic of four cores.
Seorang pelajar hendak membina satu transformer ringkas. Jadual 1 menunjukkan ciri-ciri bagi empat teras.

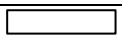
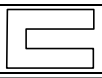
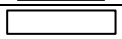
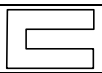
Core *Teras*	Shape of the core *Bentuk teras*	Material of core *Bahan teras*	Type of core *Jenis teras*	Thickness of wire *Ketebalan wayar*
A		Soft iron *Besi lembut*	Laminated *Berlamina*	Thick *Tebal*
B		Steel *Keluli*	Single *Tunggal*	Thin *Nipis*
C		Steel *Keluli*	Single *Tunggal*	Thin *Nipis*
D		Soft iron *Besi lembut*	Laminated *Berlamina*	Thick *Tebal*

Table 1 / *Jadual 1*

Explain the suitability of the characteristics given so that it can produce the most efficient transformer. Choose the best core and justify your answer. [10 marks / *markah*]
Terangkan kesesuaian ciri-ciri diberi supaya dapat menghasilkan transformer yang paling cekap. Pilih teras yang paling baik dan justifikasikan jawapan anda.

(i) Diagram 1.2 shows a cross section of a moving coil microphone.
Rajah 1.2 menunjukkan keratan rentas bagi suatu mikrofon gegelung bergerak.

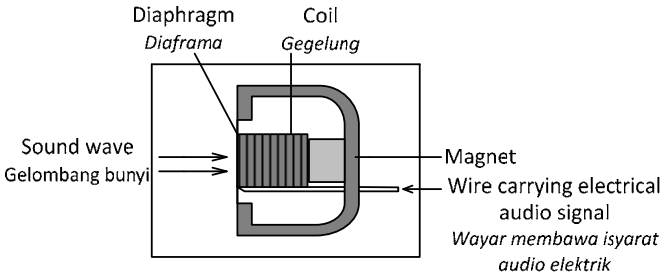


Diagram 1.2 / *Rajah 1.2*

When the diaphragm moves in response to sound, the attached coil moves in the magnetic field and generates a very small current in the wire of the coil.
Using an appropriate concept in physics, suggest and explain suitable modifications or ways to enable the microphone to detect sound effectively and generate bigger current based on the following aspect:
Apabila diaframa bergerak balas kepada bunyi, gegelung yang tersambung kepadanya bergerak ke dalam medan magnet dan menjanakan satu arus elektrik yang sangat kecil dalam wayar gegelung.
Menggunakan konsep fizik yang sesuai, cadang dan terangkan pengubahsuaian atau cara membolehkan mikrofon mengesan bunyi dengan berkesan dan menjana arus besar berdasarkan aspek berikut:
(i) thickness of diaphragm / *ketebalan diaframa*
(ii) strength of the material for diaphragm / *kekuatan bahan diaframa*
(iii) number of turns of coil / *bilangan gegelung*
(iv) diameter of the wire of coil / *diameter wayar gegelung*
(v) strength of magnet / *kekuatan magnet*

QUESTION 2 CONCEPT OF SPRING

2 Diagram 2.1 shows a spring which is being extended for a distance, *x* by a mass, *m* and the results are shown in a graph in Diagram 2.2.
Rajah 2.1 menunjukkan satu spring yang dipanjangkan kepada suatu jarak, x, oleh satu jisim dan keputusan ditunjukkan dalam graf dalam Rajah 2.2.

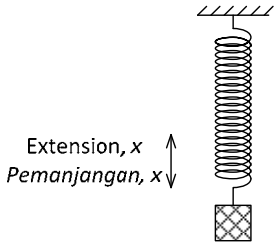


Diagram 2.1 / *Rajah 2.1*

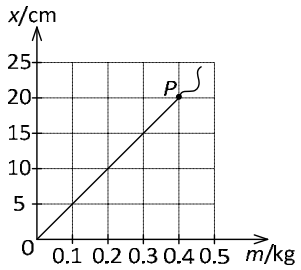


Diagram 2.2 / *Rajah 2.2*

(a) What is meant by *Hooke's Law*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan hukum Hooke?

……

(b) What is meant by *spring constant*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan pemalar spring?

……

(c) By applying the concept of **2**(b) and information in Diagram 2.2:
Dengan mengaplikasikan konsep 2(b) dan maklumat dalam Rajah 2.2:

(i) How would you show that Hooke's law is obeyed? [1 mark / *markah*]
Bagaimana anda akan menunjukkan bahawa hukum Hooke dipatuhi?

……

(ii) Name the force acting on the spring when it is being [2 marks / *markah*]
stretched / d*iregangkan* : ……
compressed / *dimampatkan* : ……

(d) From the Diagram 2.2, calculate the spring constant, *k* of the spring? [2 marks / *markah*]
Daripada Rajah 2.2, hitung pemalar spring, k bagi spring itu.

(e) Suggest a way to increase the elasticity of a spring. [1 mark / *markah*]
Cadang satu cara untuk menambahkan keelastikan suatu spring.

……

(f) All springs have its elasticity. What is meant by *elasticity*? [1 mark / *markah*]
Semua spring mempunyai keelastikannya. Apakah maksud keelastikan?

……

(g) Explain why a spring is elastic? [5 marks / *markah*]
Terangkan mengapa suatu spring adalah elastik?

……

……

……

(h) Diagram 2.3 shows the condition of four identical steel springs, before and after a load is placed on them.
Rajah 2.3 menunjukkan keadaan bagi empat spring keluli yang seiras, sebelum dan selepas satu load diletakkan padanya.

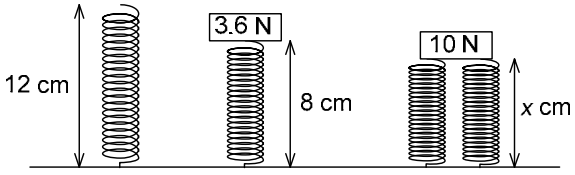


Diagram 2.3 / *Rajah 2.3*

(i) Name the form of energy stored in the spring when it is compressed. [1 mark / *markah*]
Namakan bentuk tenaga yang tersimpan di dalam spring apabila ia dimampatkan.

……

(ii) Calculate the spring constant, *k*. [1 mark / *markah*]
Hitung pemalar spring, k, itu.

……

2 **(iii)** Calculate the energy stored in the spring when it is compressed by 3.6 N load as in Diagram 2.3.
Hitung tenaga tersimpan dalam spring apabila ia dimampatkan oleh beban 3.6 N seperti dalam Rajah 2.3.
[2 marks / *markah*]

(iv) Calculate the length of spring, *x,* in Diagram 2.3. [2 marks / *markah*]
Hitung panjang spring, x, dalam Rajah 2.3.

(i) Table 2.1 shows the arrangement of springs in the weighing scale with its characteristics.
Jadual 2.1 menunjukkan susunan spring dalam penimbang skala dengan ciri-cirnya.

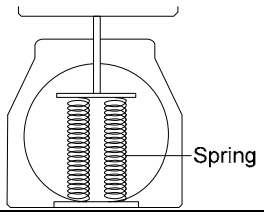
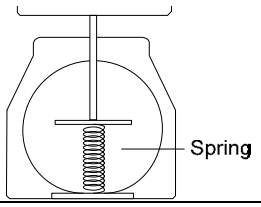
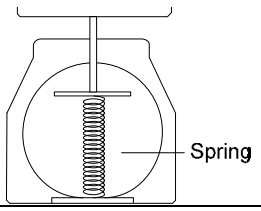
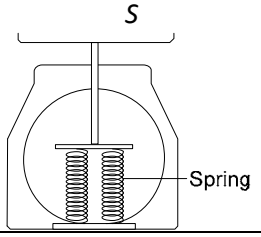
Weighing scale *Penimbang skala*	Spring constant (Nm^{-1}) *Pemalar spring (Nm^{-1})*	Spring used *Spring digunakan*	Length of spring *Panjang spring*	Rusting rate *Kadar pengaratan*
P 	850	2 spring in parallel *2 spring dalam selari*	Long *Panjang*	Low *Rendah*
Q 	250	One spring in series *Satu spring dalam siri*	Short *Pendek*	High *Tinggi*
R 	200	One spring in series *Satu spring dalam siri*	Long *Panjang*	Low *Rendah*
S 	800	2 spring in parallel *2 spring dalam selari*	Short *Pendek*	High *Tinggi*

Table 2.1 / *Jadual 2.1*

Explain the suitability of the weighing scale based on the characteristics given so that can be used to measure the small quantity of food in accurately. Determine the most weighing scale to be used dan justify your choice.
Terangkan kesesuaian penimbang skala berdasarkan ciri-ciri diberi supaya ia boleh digunakan untuk mengukur kuantiti makanan yang kecil dengan tepat. Tentukan penimbang skala yang paling sesuai digunakan dan justifikasikan pilihan anda.
[10 marks / *markah*]

2 **(j)** Diagram 2.4 shows a strong spring which is used to make a baby's cradle.
Rajah 2.4 menunjukkan satu spring kuat yang digunakan untuk membuat buaian bayi.

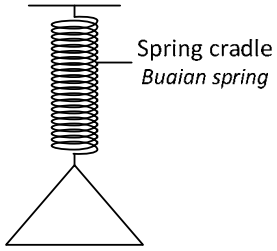


Diagram 2.4 / *Rajah 2.4*

Table 2.2 shows the characteristics of spring which could be used to make the baby's cradle.
Jadual 2.2 menunjukkan ciri-ciri spring yang digunakan untuk membuat buaian bayi.

Spring *Spring*	Force constant (Ncm^{-1}) *Pemalar daya (Ncm^{-1})*	Diameter of wire (cm) *Diameter wayar (cm)*	Diameter of the coils (cm) *Diameter gegelung (cm)*	Material *Bahan*
P	40	5.0	0.2	Alloy / *Aloi*
Q	100	2.0	0.5	Iron / *Besi*
R	50	4.0	0.8	Steel / *Keluli*
S	150	5.0	0.5	Steel / *Keluli*
T	20	1.0	0.4	Iron / *Besi*

Table 2.2 / *Jadual 2.2*

You are asked to investigate the characteristics of the springs in Table 2.2 which could be used to make the baby's cradle as shown in Diagram 2.4. Explain the suitability of the characteristics in Table 2.2 and hence, determine the most suitable spring to be used. Justify your choice. [10 marks / *markah*]
Anda diminta untuk menyiasat ciri-ciri spring dalam Jadual 2.2 yang boleh digunakan untuk membuat buaian bayi seperti ditunjukkan dalam Rajah 2.4. Terangkan kesesuaian ciri-ciri dalam Jadual 2.2 dan kemudian, tentukan spring yang paling sesuai digunakan. Justifikasi pilihan anda.

(k) Diagram 2.5 shows the graph of force against extension for two springs of same lengths which are made of different alloys.
Rajah 2.5 menunjukkan graf daya melawan pemanjangan bagi two spring yang sama panjang yang diperbuat daripada aloi yang berlainan.

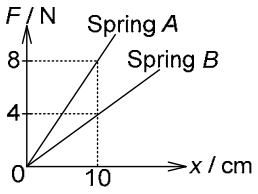


Diagram 2.5 / *Rajah 2.5*

(i) What is the relationship between the force, *F*, with the extension, *x*? [1 mark / *markah*]
Apakah hubungan antara daya, F, dengan pemanjangan, x?

……

(ii) State a law which explains the relationship? [1 mark / *markah*]
Nyatakan satu hukum yang menerangkan hubungan itu.

……

(iii) What is the quantity represented by the gradient of graph? [1 mark / *markah*]
Apakah kuantiti fizikal yang digambarkan oleh kecerunan graf?

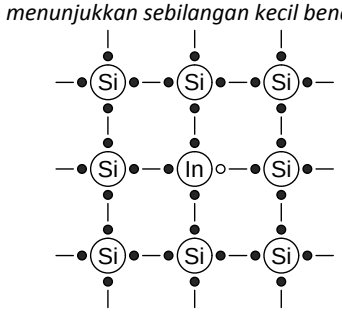
……

(iv) If the two springs are needed to make an inertia balance, which spring in Diagram 2.5 will produce a more sensitive inertia balance? State your reason. [2 marks / *markah*]
Jika dua spring diperlukan untuk membuat satu neraca penimbang, yang manakah spring dalam Rajah 2.5 akan menghasilkan neraca penimbang yang lebih sensitif? Beri sebab anda.

……

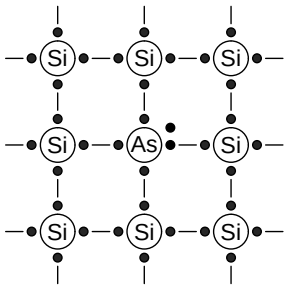
QUESTION 3 SEMICONDUCTOR DIODE

3 Diagram 3.1 and Diagram 3.2 shows a small amount of impurities are added into the pure crystal of semiconductor.
Rajah 3.1 dan Rajah 3.2 menunjukkan sebilangan kecil bendasing dimasukkan ke dalam semikonduktor tulen.



Si Silicon atom *Atom silikon*
In Indium atom *Atom indium*
● Electron *Elektron*
○ Hole *Lohong*

Diagram 3.1/ *Rajah 3.1*



Si Silicon atom *Atom silikon*
As Arsenic atom *Atom arsenik*
● Electron *Elektron*
○ Hole *Lohong*

Diagram 3.2/ *Rajah 3.2*

(a) What is semiconductor? [1 mark / *markah*]
Apakah semikonduktor?

……

(b) Based on Diagram 3.1 and Diagram 3.2, compare the type of semiconductor formed, function and valency of the impurities added into the pure semiconductor and the majority charge carriers in both of them.
Name the process of adding impurities into pure semiconductor. [5 marks]
Berdasarkan pada Rajah 3.1 dan Rajah 3.2, banding jenis semikonduktor yang terbentuk, fungsi dan valensi bagi bendasing yang ditambahkan ke dalam semikonduktor tulen dan pembawa cas majoriti dalam kedua-duanya.
Namakan proses penambahan bendasing ke dalam semikonduktor tulen. [5 markah]

……

……

……

……

……

……

(c) When the seminconductor in Diagram 3.1 and Diagram 3.2 are joined, it will make a semiconductor diode.
State the function of semiconductor diode. Explain why current flows when a diode is connected to a dry cell in forward-bias arrangement. [4 marks]
Apabila semikonduktor dalam Rajah 3.1 dan Rajah 3.2 digabungkan, ia akan membentuk satu diod semikonduktor.
Nyatakan fungsi bagi diod semikonduktor.Terangkan mengapa arus mengalir apabila satu diod disambungkan kepada sel kering dalam keadaan pincang ke depan. [4 markah]

3 **(d)** Diagram 3.3 shows a transistor in a circuit.
Rajah 3.3 menunjukkan satu transistor di dalam satu litar.

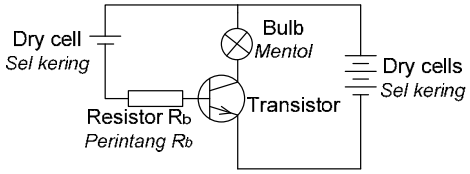


Diagram 3.3/ *Rajah 3.3*

Using appropriate physics concept, explain the use of any other suitable electronics appliances to make up an automatic circuit to switch on street lights at night and also when the surroundings are dark, for example when there is a storm or heavy rain. The light bulb is labeled "240 V, 120 W" and "a.c INPUT".
Draw a schematic diagram to show the connection in your circuit and further explain how the circuit functions.
Menggunakan konsep fizik yang sesuai, terangkan penggunaan sebarang alat elektronik untuk membentuk satu litar automatik yang akan menyalakan lampu jalan raya pada waktu malam dan juga apabila keadaan adalah gelap, contohnya apabila ribut petir atau hujan lebat. Mentol itu berlabel "240 V, 120 W" dan "INPUT a.u".
Lukis satu rajah untuk menunjukkan sambungan dalam litar dan terangkan bagaimana litar berfungsi.

Your answer should include the following aspects:
Jawapan anda hendaklah merangkumi aspek-aspek berikut:

(i) Source of electrical energy / Sumber tenaga elektrik
(ii) Electronics appliance(s) which is sensitive to light / *Alat elektronik yang peka cahaya*
(iii) Type of transistor used / *Jenis transistor yang digunakan*
(iv) Any other electronics appliance(s) and its function / *Sebarang alat elektronik diperlukan dan fungsinya*

[10 marks / *markah*]

(e) Table 3.1 shows the characteristics of four alternating current generators, *W*, *X*, *Y* and *Z*.
Jadual 3.1 menunjukkan cirri-ciri bagi empat penjana arus ulang-alik, W, X, Y dan Z.

Generator / *Penjana*	Number of turns of coil / *Bilangan gegelung*	Strength of magnets / *Kekuatan magnet*
W	6 000	High / *Tinggi*
X	10 000	Medium / *Sederhana*
Y	9 000	High / *Tinggi*
Z	5 000	Medium / *Sederhana*

Table 3.1 / *Jadual 3.1*

Table 3.2 shows the characteristics of rectification circuits, *A*, *B*, *C* and *D* to be used with one of the generators.
Jadual 3.2 menunjukkan ciri-ciri bagi litar rektifikasi, A, B, C dan D yang akan digunakan dengan satu penjana.

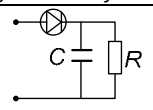
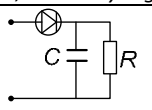
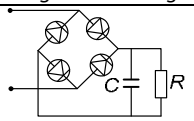
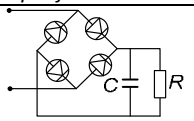
Rectification circuit *Litar rektifikasi*	 A	 B	 C	 D
Capacitance of *C* *Kapasitan C*	Large *Besar*	Small *Kecil*	Large *Besar*	Small *Kecil*

Table 3.2 / *Jadual 3.2*

Study the specifications of all the four generators and four rectification circuits from the following aspects:
Kaji spesifikasi bagi semua empat jenis penjana dan empat litar rektifikasi daripada aspek-aspek berikut:
– Number of turns of coil in the generator / *Bilangan gegelung dalam penjana*
– Strength of the magnets in the generator / *Kekuatan magnet dalam penjana*
– Arrangement of components in the rectification circuit / *Susunan komponen-komponen dalam litar rektifikasi*
– Capacitance of the capacitor in the rectification circuit / *Kapasitan kapasitor dalam litar rektifikasi*
State the most suitable generator and the most suitable rectification circuit to be used. Give justifications.
Nyatakan penjana yang paling sesuai dan litar rektifikasi yang paling sesuai untuk digunakan. Beri justifikasi.

[10 marks / *markah*]

QUESTION 4 SEMICONDUCTOR DIODE

4 **(a)** Diagram 4.1 and Diagram 4.2 shows two diodes *A* and *B*, two identical bulbs *P* and *Q* are connected to a dry cell in two different arrangements.
Rajah 4.1 dan Rajah 4.2 menunjukkan dua diod A dan B, dua mentol seiras P dan Q yang disambungkan kepada satu sel kering dalam dua cara penyusunan berlainan.

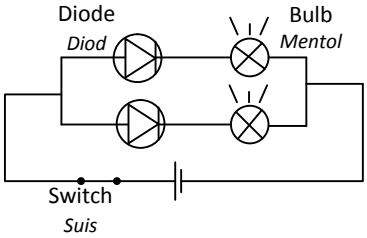


Diagram 4.1 / *Rajah 4.1*

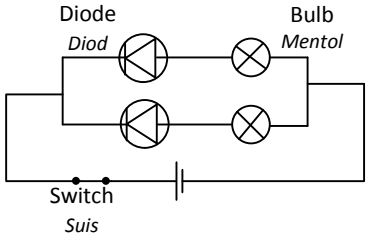


Diagram 4.2 / *Rajah 4.2*

The diode is made of join between *p*-type and *n*-type semiconductor.
Diod itu diperbuat daripada gabungan semikonduktor jenis-p dan jenis-n.

(a) What is *semiconductor*? [1 mark / *markah*]
Apakah itu semiconductor?

……

(b) Give two examples of semiconductor materials. [2 marks / *markah*]
Beri dua contoh bahan semikonduktor.

……

(c) The doping of semiconductor with other material can improve its conductivity.
Pendopan semikonduktor dengan bahan lain boleh memperbaiki kekonduksiannya.

(i) What is meant by '*doping*'? [1 mark / *markah*]
Apakah maksud 'pendopan'?

……

(ii) With aid of diagram, explain how you go to produce a *p*-type semiconductor. [5 marks / *markah*]
Dengan bantuan gambarajah, terangkan bagaimana anda menghasilkan semikonduktor jenis-p.

(iii) With aid of diagram, explain how you go to produce *n*-type semiconductor. [5 marks / *markah*]
Dengan bantuan gambarajah, terangkan bagaimana anda menghasilkan semikonduktor jenis-n.

(d) Based on Diagram 4.1 and Diagram 4.2:
Berdasarkan pada Rajah 4.1 dan Rajah 4.2:

(i) Compare the connection of diodes to the terminal of the dry cell. [2 marks / *markah*]
Banding sambungan diod-diod kepada terminal sel kering.

Diagram 4.1 / *Rajah 4.1*: ……
Diagram 4.2 / *Rajah 4.2*: ……

(ii) Compare the lighting of the bulbs. [1 mark / *markah*]
Banding nyalaan mentol-mentol itu.

……

(iii) State the function of the diode. [1 mark / markah]
Nyatakan fungsi diod itu.

……

4 **(e)** Draw the arrangement of four diodes and suitable power supply in the space given in Diagram 4.3 that can be used to produce full wave rectifier circuit. [2 marks / *markah*]
Lukis susunan empat diod dan bekalan kuasa yang sesuai dalam ruangan dalam Rajah 3 yang boleh menghasilkan litar rektifikasi penuh gelombang.

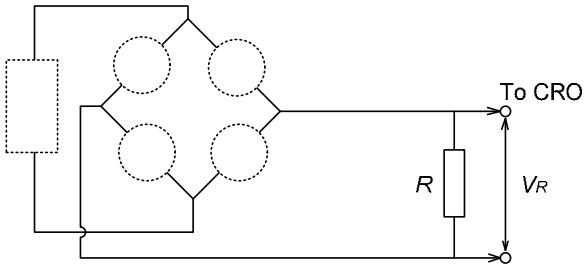
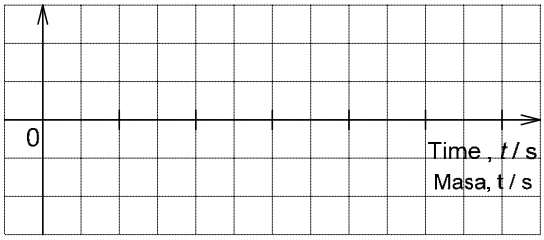


Diagram 4.3 / *Rajah 4.3*

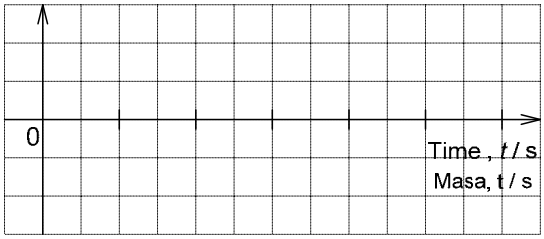
(f) Based on the circuit in **4**(e), sketch the output voltage shown by CRO on the space below: [2 marks / *markah*]
Berdasarkan pada litar dalam 4(e), lakarkan voltan output yang ditunjukkan oleh OSK pada ruangan bawah.

Output voltage
Voltan output



(g) If there is a capacitor being connected parallel to the resistor *R*, sketch the new output voltage shown by CRO on the space below. [2 marks / *markah*]
Jika satu kapasitor disambungkan secara selari kepada perintang R, lakarkan bentuk voltan output baru yang ditunjukkan oleh CRO pada ruangan bawah.

Output voltage
Voltan output



(h) State the function of capacitor in full wave rectification circuit. [1 mark / *markah*]
Nyatakan fungsi kapasitor dalam litar rektifikasi gelombang penuh.

.....

(i) Diagram 4.4 shows a transformer with a bulb at its output terminals. The bulb lights up at normal brightness.
Rajah 4.4 menunjukkan satu transformer dan satu mentol pada terminal output. Mentol itu menyala pada kecerahan normal.

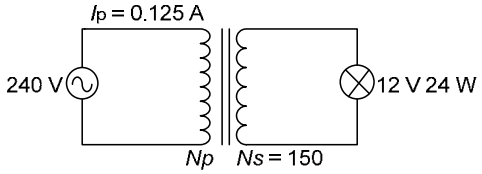


Diagram 4.4 / *Rajah 4.4*

(i) State the type of transformer used in Diagram 4.4. [1 mark / *markah*]
Nyatakan jenis transformer yang digunakan dalam Rajah 4.4.

.....

(ii) Determine the value of number of turns of primary coils, N_P. [2 marks / *markah*]
Tentukan nilai bagi bilangan gegelung primer N_p.

.....

(iii) Calculate the efficiency of the transformer. [2 marks / *markah*]
Hitung kecekapan bagi transformer itu.

.....

(iv) Explain why transformer must use a.c. voltage instead of d.c voltage? [1 mark / *markah*]
Terangkan mengapa transformer mesti menggunakan voltan a.u daripada voltan a.t.?

.....

QUESTION 5 RADIOACTIVITY

5 Diagram 5.1 shows a method used to detect leakage of pipes lay underground. A little radioisotope substance is dissolved in the water that flows in the pipes. A Geiger-Muller tube which is connected to the rate meter is then moved over the pipes according to the layout plan of the underground pipes.
Rajah 5.1 menunjukkan satu kaedah untuk mengesan kebocoran paip di bawah bumi. Sedikit bahan radioisotop dilarutkan ke dalam air yang akan mengalir di dalam paip. Satu tiub Geiger-Muller yang disambungkan kepada kadar meter kemudian digerakkan menerusi paip mengikut pelan paip bawah bumi.

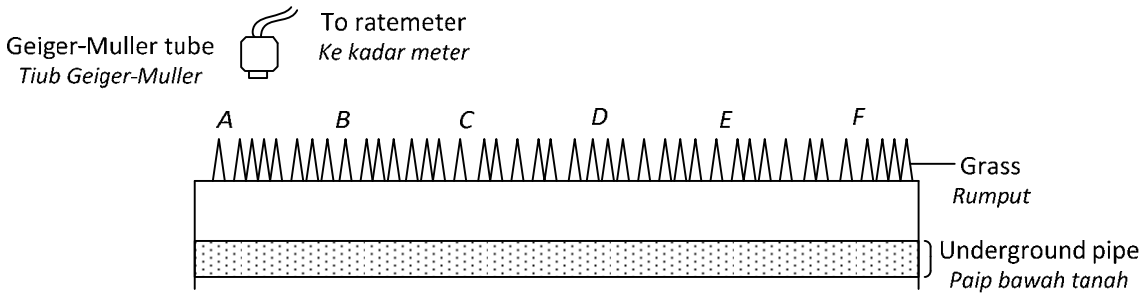


Diagram 5.1 / *Rajah 5.1*

Table 5.1 shows the readings of the rate meter at the different locations.
Jadual 5.1 menunjukkan bacaan-bacaan bagi kadar meter pada lokasi berlainan.

Location of Geiger-Muller Tube *Lokasi bagi tiub Geider-Muller*	*A*	*B*	*C*	*D*	*E*	*F*
Reading of the ratemeter (counts per minute) *Bacaan bagi kadar meter (bilang per minit)*	290	295	284	372	290	216

Table 5.1 / *Jadual 5.1*

(a) What is meant by radioisotope? [1 mark / *markah*]
Apakah yang dimaksudkan dengan radioisotop?

.....

(b) Based on Table 5.1, state the location on the pipe where the leakage takes place. State reason for your answer.
Berdasarkan pada Jadual 5.1. nyatakan lokasi pada paip di mana kebocoran dikesan. Nyatakan sebab untuk jawapan anda.
[1 mark / *markah*]

.....

.....

.....

(c) Radioactive decay is a process where an unstable nucleus becomes a more stable nucleus by emitting radiation. Table 5.2 shows the decay of a radioactive nucleus. Radioactivity is a *random* and spontaneous *process*.
Pereputan radioaktif merupakan satu proses di mana nukleus tidak stabil menjadi nukleus stabil dengan membebaskan sinaran. Jadual 5.2 menunjukkan pereputan bagi nukleus radioaktif. Radioaktiviti adalah poses rawak dan spontan.

Time (hour) / *Masa (jam)*	0	4	8	12	16
Radioactive (Counts per minute) / *Radioaktif (bilang per minute)*	4000	2000	1000	500	250

Table 5.2 / *Jadual 5.2*

(i) What is meant by the term *radioactivity* and *half-life*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan istilah radioaktiviti dan separuh hayat?

.....

.....

.....

(ii) What is meant by *alpha*, *beta* and *gamma*? *Match the following* [3 marks / *markah*]
Apakah yang dimaksudkan dengan alfa, beta dan gama?

.....

.....

.....

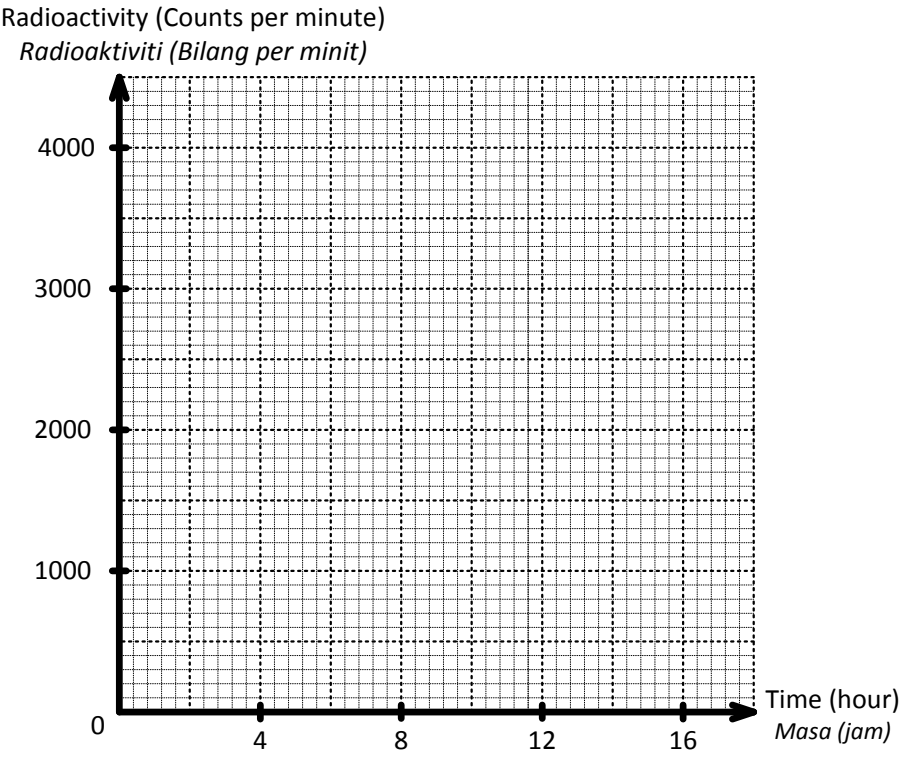
(iii) What is meant by random? [1 mark / *markah*]
Apakah maksud rawak?

.....

(iv) What is meant by spontaneous? [1 mark / *markah*]
Apakah maksud spontan?

.....

5 **(c)** **(v)** On the graph paper below, draw a graph of radioactivity against time.
Pada kertas graf bawah, lukiskan satu graf radioaktiviti melawan masa.



(vi) Based on your answer in **5**(c)(v), determine the half-life of the radioactive. [2 marks / *markah*]
*Berdasarkan pada jawapan anda di **4**(c)(v), tentukan separuh hayat bagi radioaktif itu.*

(d) Diagram 5.2 shows a nuclide Thorium-234, $^{234}_{90}Th$ is placed in a container. Thorium-234 nuclide decays to a nuclide Radium-226, $^{226}_{88}Ra$ by emitting α particle and β particle.

Rajah 5.2 menunjukkan satu nuklida Thorium-243, $^{234}_{90}Th$ yang diletakkan dalam satu bekas. Nuklida $^{234}_{90}Th$ mereput kepada nuklida $^{226}_{88}Ra$ dengan membebaskan zarah α dan zarah β.

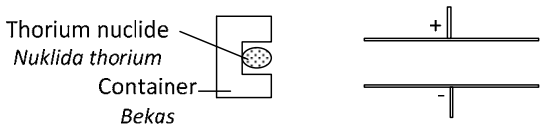


Diagram 5.2 / *Rajah 5.2*

(i) In Diagram 5.2, draw the path of α particle and β particle. [2 marks / *markah*]
Dalam Rajah 5.2, lukis laluan bagi zarah α dan zarah β.

(ii) Explain your answer in **5**(d)(i). [1 mark / *markah*]
*Terangkan jawapan anda di **5**(d)(i).*

.....

(iii) Calculate the number of α particle and β particle that emitted in the Thorium-234 decays after writing the decay equation. [2 marks / *markah*]
Hitung bilangan zarah α dan zarah β yang dibebaskan dalam Thorium-234 pereputan selepas menulis persamaan pereputan.

.....

(iv) Thorium-234 has half-life of 20 days and initial mass of 48 g. Calculate the mass of undecayed Thorium-234 after 60 days. [2 marks / *markah*]
Thorium-234 mempunyai separuh hayat 20 hari dan jisim awal 48 g. Hitung jisim Thorium-234 yang tidak mereput selepas 60 hari.

QUESTION 6 RADIOACTIVITY

6 Diagram 6.1 shows the activity of a radioactive substance *X* and *Y* being measured by a Geiger-Muller tube connected to a ratemeter. Diagram 6.2 shows the decay curves obtained for radioactive substance *X* and *Y*.
Rajah 6.1 menunjukkan aktiviti bagi suatu bahan radioaktif X dan Y yang diukur oleh satu tiub Geiger-Muller yang disambungkan ke satu kadar meter. Rajah 6.2 menunjukkan lengkung pereputan yang diperolehi bagi bahan radioaktif X dan Y.

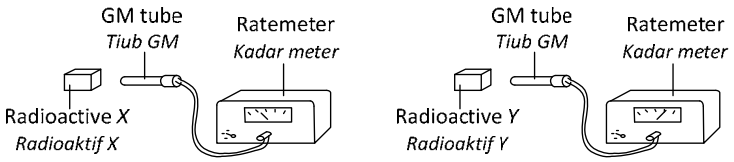


Diagram 6.1 / *Rajah 6.1*

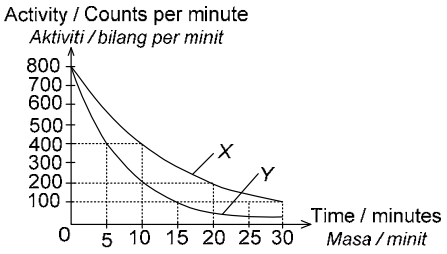


Diagram 6.2 / *Rajah 6.2*

(a) **(i)** What is the meaning of *half life*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan separuh hayat?

.....

(ii) Based on the decay curves in Diagram 6.2, state the half life of radioactive substance *X* and *Y*. For radioactive substance *X* and *Y*, what percentage remains undecayed after 10 minutes? [4 marks / *markah*]
Berdasarkan pada lengkung pereputan dalam Rajah 6.2, nyatakan separuh hayat bagi bahan radioaktif X dan Y. Untuk bahan radioaktif X dan Y, berapakah peratus yang tidak mereput selepas 10 minit?

(iii) Based on the answers in **6**(a)(i) and **6**(a)(ii), compare the decay rates of radioactive substance *X* and *Y*. Hence state the relationship between decay rate and half life. [2 marks / *markah*]
*Berdasarkan pada jawapan di **6**(a)(i) dan 4(a)(ii), bandingkan kadar pereputan bagi bahan radioaktif X dan Y. Kemudian, nyatakan hubungan antara kadar pereputan dan separuh hayat.*

.....

(iv) Give a reason why the readings of the ratemeters did not drop to zero after radioactive substance X and *Y* were removed. [1 mark / *markah*]
Berikan satu sebab mengapa bacaan pada kadar meter tidak jatuh ke sifar selepas bahan radioaktif X dan Y sudah dialihkan?

.....

(b) Table 6.1 shows the characteristics of five radioisotopes, *P*, *Q*, *R*, *S* and *T*.
Jadual 6.1 menunjukkan ciri-ciri bagi lima radioisotop, P, Q, R, S dan T.

Radioisotope *Radioisotop*	Half-life *Separuh hayat*	Ionizing power *Kuasa pengionan*	Penetrating power *Kuasa penembusan*	Radiation *Sinaran*	State of matter *Keadaan jirim*
P	5.0 minutes / *5 minit*	Low / *Rendah*	High / *Tinggi*	Gamma / *Gama*	Liquid / *Cecair*
Q	8 days / *8 hari*	High / *Tinggi*	Low / *Rendah*	Alpha / *Alfa*	Solid / *Pepejal*
R	6 hours / *6 jam*	Low / *Rendah*	High / *Tinggi*	Gamma / *Gama*	Liquid / *Cecair*
S	5 years / *5 tahun*	Low / *Rendah*	High / *Tinggi*	Beta / *Beta*	Solid / *Pepejal*
T	7 hours / *7 jam*	High / *Tinggi*	Low / *Rendah*	Alpha / *Alfa*	Liquid / *Cecair*

Table 6.1 / *Jadual 6.1*

As a medical officer, you are required to determine the most suitable radioisotope as a radiotherapy treatment for a brain tumor. Explain the characteristics of all the five radioisotopes given and then, choose the most suitable radioisotope to be used. Justify your choice.
Sebagai pegawai perubatan, anda ditugaskan untuk menentukan radioisotop yang paling sesuai sebagai rawatan radioterapi untuk kanser otak. Terangkan ciri-ciri bagi semua radioisotop yang diberikan dan kemudian, pilih radioisotop yang paling sesuai digunakan. Berikan justifikasi pilihan anda.
Answer Space / Ruangan Jawapan:

[10 marks / *markah*]

QUESTION 7 RADIOACTIVITY

7 The production of nuclear energy and volume detection are the two examples of application of radioactive substances in industry. Table 7.1 shows reaction equation and total mass of atom before and after nuclear fission process. Table 7.2 shows reaction equation and total mass of atom before and after nuclear fusion process.

Penghasilan tenaga nuklear dan isipadu pengesanan adalah dua contoh aplikasi bagi bahan radioaktif dalam industri. Jadual 7.1 menunjukkan persamaan tindak balas dan jumlah jisim atom sebelum dan selepas proses pembelahan. Jadual 4.4 menunjukkan persamaan tindak balas dan jumlah jisim atom sebelum dan selepas proses pelakuran.

	Nuclear fission / *Pembelahan nuklear*	
	Before reaction / *Sebelum tindak balas*	After reaction / *Selepas tindak balas*
Equation / *Persamaan*	$^{239}_{94}Pu + {}^{1}_{0}n$	$^{141}_{56}Ba + {}^{97}_{38}Sr + 2{}^{1}_{0}n$ + Energy
Total mass / *Jumlah jisim*	240.06082 *a.m.u* / *240.06082 u.j.a*	239.85830 *a.m.u* / *239.85830 u.j.a*

Table 7.1 / *Jadual 7.1*

	Nuclear fusion / *Pelakuran nuklear*	
	Before reaction / *Sebelum tindak balas*	After reaction / *Selepas tindak balas*
Equation / *Persamaan*	$^{2}_{1}H + {}^{3}_{1}H$	$^{4}_{2}He + {}^{1}_{0}n$ + Energy
Total mass /*Jumlah jisim*	5.03013 *a.m.u* / *5.03013 u.j.a*	5.01043 *a.m.u* / *5.01043 u.j.a*

Table 7.2 / *Jadual 7.2*

(a) **(i)** What is meant by *nuclear fission*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan pembelahan nukleus?

.....

(ii) What is meant by *nuclear fusion*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan pelakuran nukleus?

.....

(ii) Using the information in Table 7.1 and 7.2, compare the nuclear fission and nuclear fusion and then relate the relationship between mass and energy released. [5 marks / *markah*]
Menggunakan maklumat dalam Jadual 7.1 dan 7.2, bandingkan pembelahan nukleus dan pelakuran nukleus dan kemudian kaitkan hubungan antara jisim dan tenaga yang dibebaskan.

.....

.....

.....

(b) Diagram 7.1 shows a system used in a factory to ensure the volume of guava juice in a bottle is uniform.
Rajah 7.1 menunjukkan satu sistem yang digunakan dalam kilang untuk memastikan isipadu jambu dalam botol ialah seragam.

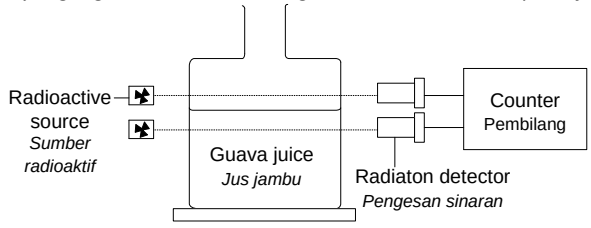


Diagram 7.1 / *Rajah 7.1*

Table 7.3 shows the characteristics of five radioisotopes P, Q, R, S and T.
Jadual 7.3 menunjukkan ciri-ciri bagi lima radioisotop P, Q, R, S dan T.

Radioisotope *Radioisotop*	Half-life *Separuh hayat*	Types of ray *Jenis sinaran*	State of matter *Keadaan jirim*	Ionising power *Kuasa pengionan*
P	7 hours / *7 jam*	Alpha / *Alfa*	Solid / *Pepejal*	High / *Tinggi*
Q	10 days / *10 hari*	Beta / *Beta*	Liquid / *Cecair*	Moderate / *Sederhana*
R	100 days / *100 hari*	Gamma / *Gama*	Solid / *Pepejal*	Low / *Rendah*
S	10 years / *10 tahun*	Gamma / *Gama*	Liquid / *Cecair*	High / *Tinggi*
T	30 years / *10 tahun*	Beta / *Beta*	Solid / *Pepejal*	Low / *Rendah*

Table 7.3 / *Jadual 7.3*

As a factory engineer, you are required to determine the most suitable radioisotope that can be used by the system to ensure the volume of guava juice is uniform. Determine the most suitable radioisotope and give the reason for your choice. [10 marks / *markah*]
Sebagai jurutera kilang, anda diminta menentukan radioisotop yang paling sesuai yang boleh digunakan oleh sistem untuk memastikan isipadu jus jambu adalah seragam. Tentukan radioisotop yang paling sesuai dan beri sebab bagi pilihan anda.

QUESTION 8 WAVES

8 Diagram 8.1 and 8.2 show wave pattern produced by the vibration of two spherical dippers on the water surface set to be at different distances.
Rajah 8.1 dan Rajah 8.2 menunjukkan corak gelombang yang dihasilkan oleh getaran dua penggetar sfera yang disetkan pada jarak berlainan pada permukaan air.

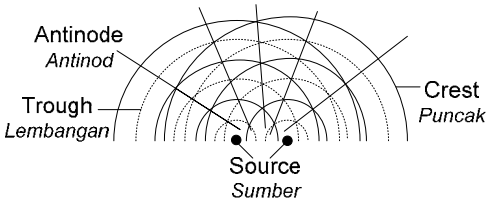


Diagram 8.1 / *Rajah 8.1*

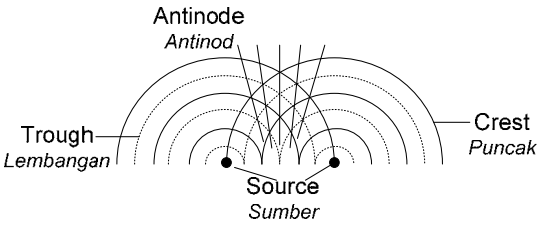


Diagram 8.2 / *Rajah 8.2*

(a) **(i)** What is the wave phenomenon shown in Diagram 8.1 and 8.2? [1 mark / *markah*]
Apakah fenomena gelombang yang ditunjukkan dalam Rajah 8.1 dan Rajah 8.2?

……

(ii) Explain why the water level in the ripple tank must be at constant depth during the experiment. [2 marks]
Terangkan mengapa aras air di dalam tangki riak mesti pada kedalaman malar semasa eksperimen. [2 markah]

……

(iii) Observe Diagram 8.1 and 8.2, compare the distance between two sources, wavelength of the propagating water waves, the wave patterns produced by the spherical dippers and the distance between two adjacent antinodes. State the relationship between the distance of two coherent sources and the distance of two consecutive antinodes lines. [5 marks / *markah*]
Perhatikan Rajah 8.1 dan 8.2, bandingkan jarak antara dua sumber, panjang gelombang perambatan gelombang air, corak gelombang yang dihasilkan oleh penggetar sfera dan jarak antara dua antinod berturutan. Nyatakan hubungan antara jarak antara dua sumber koheren dan jarak antara dua garis antinod berturutan.

……

……

……

(b) Sonar technique can be used to determine the distance between two positions. Ultrasonic wave is used in this technique.
Teknik sonar boleh digunakan untuk menentukan jarak antara dua kedudukan. Gelombang ultrasonik digunakan dalam teknik ini.

(i) What is *sonar*? [1 mark / *markah*]
Apakah itu sonar?

……

(ii) Explain why using ultrasonic wave is better than just ordinary sound waves. [2 marks / *markah*]
Terangkan mengapa menggunakan gelombang ultrasonik adalah lebih baik daripada gelombang bunyi biasa.

……

(iii) A marine researcher wants to use ultrasonic sound to determine the depth of the ocean bed. Explain how he can do so. [5 marks / *markah*]
Seorang penyelam mahu menggunakan bunyi ultrasonik untuk menentukan kedalaman dasar laut. Terangkan bagaimana dia boleh berbuat demikian.

……

……

……

(iv) You have been assigned to assemble a speaker system to improve the acoustics of a school hall. Using the appropriate physics concept, explain how the installation of the speaker system to be done to improve audible sound. In your explanation , elaborate on the following aspects:
Anda ditugaskan untuk memasang sistem peti suara untuk memperbaiki askustik suatu dewan sekolah. Menggunakan konsep fizik yang sesuai, terangkan bagaimana sistem peti suara dipasang untuk memperbaiki bunyi audibel. Dalam penerangan anda, terangkan aspek berikut:
(i) Distance between two stereo speakers / *Jarak antara dua peti suara stereo*
(ii) Wall and floor finishing / *Persiapan dinding dan lantai*
(iii) Power of the loud speakers / *Kuasa pembesar suara*
(iv) Positioning of speakers and microphones / *Kedudukan pembesar suara dan mikrofon*

[10 marks / *markah*]

QUESTION 9 WAVES

9 Diagram 9.1 and Diagram 9.2 shows water waves passing through the entrance of two different harbours.
Rajah 9.1 dan Rajah 9.2 menunjukkan gelombang air menerusi pintu bagi dua pelabuhan yang berbeza.

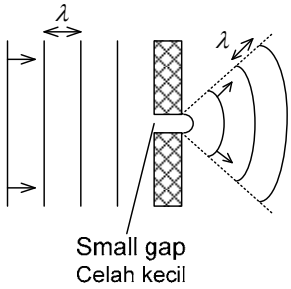


Diagram 9.1 / *Rajah 9.1*

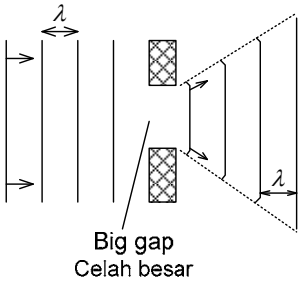


Diagram 9.2 / *Rajah 9.2*

(a) Name the type of wave of water wave. [1 mark / *markah*]
Namakan jenis gelombang bagi gelombang air.

.....

(b) **(i)** Name the phenomenon involved in Diagram 9.1 and Diagram 9.2. [1 mark / *markah*]
Namakan fenomenon terlibat dalam Rajah 9.1 dan Rajah 9.2.

.....

(ii) What will happen to the frequency, wavelength and speed of wave after passing through the gap?
Apakah yang akan berlaku pada frekuensi, panjang gelombang dan laju gelombang selepas menerusi celah itu?

Frequency / *Frekuensi* : .....

Wavelength / *Panjang gelombang* : .....

Speed of wave / *Laju gelombang* : .....

(c) Between Diagram 9.1 and Diagram 9.2, which one shows the obvious diffraction effect? Explain why. [2 marks]
Antara Rajah 9.1 dan Rajah 9.2, yang manakan menunjukkan kesan diffraction yang jelas? Terangkan mengapa. [2 marks]

.....

.....

(d) Between Diagram 9.1 and Diagram 9.2, which one shows the bigger energy wave entering the gap? [2 marks]
Antara Rajah 9.1 dan Rajah 9.2, yang manakan menunjukkan tenaga gelombang yang lebih besar memasuki gap? [2 marks]

.....

(e) Diagram 9.3 and Diagram 9.4 show the waves entering two different mediums.
Rajah 9.3 dan Rajah 9.4 menunjukkan gelombang-gelombang memasuki dua medium yang berbeza.

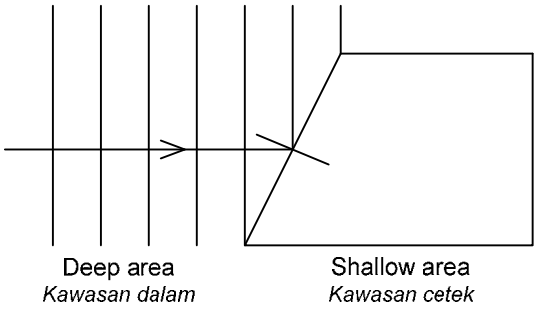


Diagram 9.3 / *Rajah 9.3*

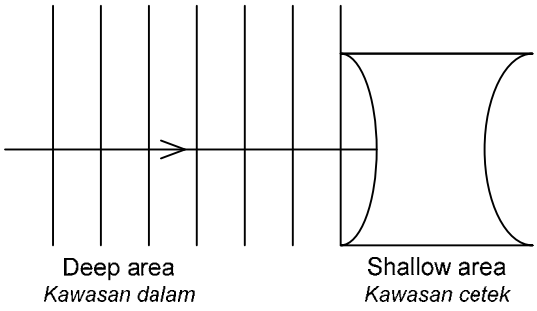


Diagram 9.4 / *Rajah 9.4*

(i) Name the phenomenon involved. [1 mark / *markah*]
Namakan fenomenon terlibat.

.....

(ii) What will happen to the frequency, wavelength and speed of wave after passing through the gap?
Apakah yang akan berlaku pada frekuensi, panjang gelombang dan laju gelombang selepas menerusi celah itu?

Frequency / *Frekuensi* : .....

Wavelength / *Panjang gelombang* : .....

Speed of wave / *Laju gelombang* : .....

(iii) Complete the wave pattern in both Diagram 9.3 and Diagram 9.4. [4 marks / *markah*]
Lengkapkan corak gelombang untuk kedua-dua Rajah 9.3 dan Rajah 9.4.

QUESTION 10 WAVES

10 Diagram 10.1 shows the arrangement of apparatus for Young's double slit experiment. A white light source is passed through a red filter to produce *monochromatic light* and *coherent*. Diagram 10.2 shows the pattern of the fringe formed on the screen. The experiment is repeated by using a blue filter and the fringes formed are shown in Diagram 10.3.
Rajah 10.1 menunjukkan susunan radas untuk eksperimen dwicelah Young. Satu sumber cahaya putih dilalukan menerusi satu penuras merah untuk menghasilkan cahaya monokromatik dan koheren. Rajah 10.2 menunjukkan corak pinggir yang terbentuk pada skrin. Eksperimen itu diulangi dengan menggunakan penuras biru dan corak pinggir yang terbentuk ditunjukkan dalam Rajah 10.3.

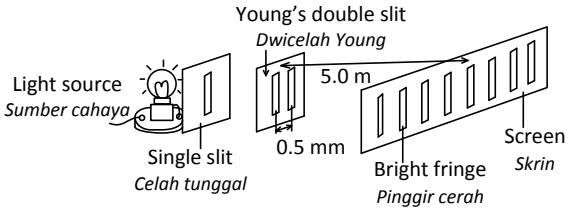


Diagram 10.1 / Rajah 10.1

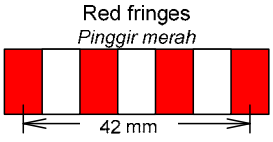


Diagram 10.2 / *Rajah 10.2*

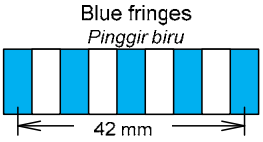


Diagram 10.3 / *Rajah 10.3*

(a) What is meant by *monochromatic light*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan cahaya monokromatik?

……

(b) What is meant by *coherent*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan koheren?

……

(c) Underline the correct answer in the bracket to complete the sentence below. [1 mark / *markah*]
Gariskan jawapan yang betul di dalam kurungan untuk melengkapkan ayat berikut.

Light wave is a (longitudinal , transverse) wave.

Gelombang cahaya adalah gelombang (membujur , melintang)

(d) The bright fringes formed on the screen are the product of two phenomena of waves. Name those two phenomena. [2 marks / markah]
Pinggir cerah yang terbentuk pada skrin merupakan hasil daripada dua fenomena gelombang. Namakan dua fenomena tersebut.

……

(e) Calculate the wavelength of the red light and blue light respectively. [4 marks / *markah*]
Hitung panjang gelombang bagi cahaya merah dan cahaya biru masing-masing.

(f) Diagram 10.4 shows a driver that is driving under a hot sun, sees a pool of water appearing on the road ahead, but the pool of water disappears as the car approaches it.
Rajah 10.4 menunjukkan seorang pemandu yang memandu di bawah cahaya panas terik melihat satu kolam air muncul pada permukaan jalan hadapan tetapi kolam air itu akan hilang semasa mendekatinya.

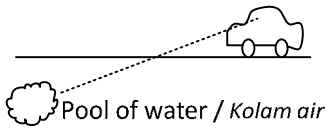


Diagram 10.4 / *Rajah 10.4*

(i) Name this natural phenomenon as observed by the driver. [1 mark / *markah*]
Namakan fenomena semulajadi seperti yang diperhatikan oleh pemandu.

……

(ii) State the physics concept that is involved in this phenomenon.
Nyatakan konsep fizik yang terlibat dalam fenomena ini.

……

(iii) When light rays propagates from a denser medium to a less dense medium, state what happen to the direction of the refracted rays.
Apabila cahaya merambat daripada medium lebih tumpat kepada medium kurang tumpat, nyatakan apa yang akan berlaku kepada arah sinar biasan.

……

……

(iv) What is meant by *wavelength*?
Apakah yang dimaksudkan dengan panjang gelombang?

……

QUESTION 11 WAVES

11 Ultrasonic echoes are wisely used in medicine to 'see' the internal organs of inside the body. Diagram 11 shows the use of ultrasound scanner across the mother's womb to see the unborn babies.

Gema ultrasonik digunakan meluas dalam perubatan untuk 'melihat' organ-organ dalaman badan. Rajah 11 menunjukkan penggunaan pengimbas ultrasonik sepanjang kandungan ibu untuk melihat bayi yang belum lahir.

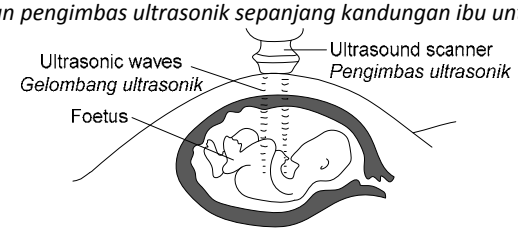


Diagram 11 / *Rajah 11*

Table 11 shows the characteristics of the ultrasound scanner *W*, *X*, *Y* and *Z*.

Jadual 11 menunjukkan ciri-ciri bagi pengimbas ultrasonik W, X, Y dan Z.

Scanner *Pengimbas*	Type of wave *Jenis gelombang*	Frequencies range (Hz) *Julat frekuensi (Hz)*	Penetrating power *Kuasa penembusan*	Ionizing power *Kuasa pengionan*
W	Mechanical / *Mekanikal*	< 20 000	High / *Tinggi*	Low / *Rendah*
X	Mechanical / *Mekanikal*	> 20 000	Low / *Rendah*	Low / *Rendah*
Y	Electromagnet / *Elektromagnet*	< 20 000	Low / *Rendah*	High / *Tinggi*
Z	Electromagnet / *Elektromagnet*	> 20 000	Low / *Rendah*	High / *Tinggi*

Table 11 / *Jadual 11*

Explain the suitability of each characteristic in Table 11 that can be used as ultrasound scanner to scan the image of foetus safely. Determine the most suitable ultrasound scanner to be used and hence, justify your choice.

Terangkan kesesuaian setiap ciri dalam Jadual 11 yang boleh digunakan sebagai pengimbas ultrasonik bagi mengimbas imej foetus dengan selamat. Tentukan pengimbas ultrasonik yang paling sesuai dan kemudian, berikan justifikasi pilihan anda.

[10 marks / *markah*]

(f) Diagram 11.2 shows a group of waves *P*, *Q*, *R*, *S*, *T* and *U* arranged to their frequencies and wave lengths. The energy of the wave is increasing from left to right. They propagate at same speed in vacuum.

Rajah 11.2 menunjukkan satu kumpulan gelombang P, Q, R, S, T dan U yang disusun mengikut frekuensi dan panjang gelombangnya. Tenaga gelombang bertambah daripada kiri ke kanan. Mereka merambat dengan kelajuan sama di vakum.

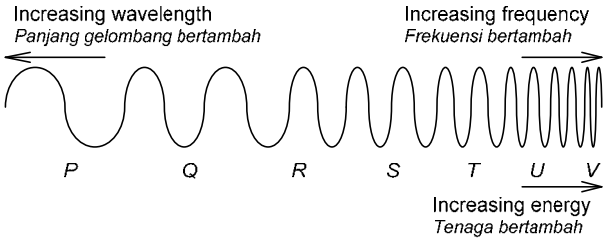


Diagram 11.2 / *Rajah 11.2*

(i) Name the arrangement pattern given to a group of waves as shown in Diagram 11.2. [1 mark / *markah*]

Namakan corak susunan diberi kepada satu kumpulan gelombang seperti ditunjukkan dalam Rajah 11.2.

.....

(ii) Based on Diagram 11.2, compare the changes from left to right on amplitude, wavelength, frequency and energy of the waves. Relate the frequency of the wave to the energy of the wave and also the wavelength of the wave to the energy of wave. [5 marks / *markah*]

Berdasarkan pada Rajah 11.2, bandingkan perubahan daripada kiri ke kanan pada amplitud, panjang gelombang, frekuensi dan tenaga gelombang itu. Kaitkan frekuensi gelombang dengan tenaga gelombang dan juga panjang gelombang dengan tenaga gelombang.

.....

.....

.....

(iii) Name the waves of *P*, *Q*, *R*, *S*, *T* and *U*. [7 marks / *markah*]

Namakan gelombang-gelombang bagi P, Q, R, S, T and U.

.....

(iv) State the use of wave *P* and *Q*. [2 marks / *markah*]

Nyatakan kegunaan gelombang P dan Q.

.....

QUESTION 12 GAS LAWS

12 The characteristics of a fixed mass of gas can be explained in terms of its changes in pressure, volume and temperature of gas.

(a) **(i)** State the meaning of Boyle's law. [1 mark / *markah*]
Nyatakan maksud hukum Boyle.

.....

(ii) State the meaning of Boyle's law. [1 mark / *markah*]
Nyatakan maksud hukum Boyle.

.....

(iii) State the meaning of Boyle's law. [1 mark / *markah*]
Nyatakan maksud hukum Boyle.

.....

(b) Diagram 12.1 shows an experiment being carried out to investigate a law of gas. A calibrated syringe is connected to the bourdon gauge using a rubber tube.

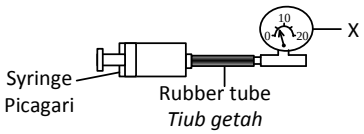


Diagram 12.1 / Rajah 12.1

(i) Name the device X / *Namakan alat X.*. [1 mark / markah]

.....

(ii) State the physical quantity being measured by device X. [1 mark / markah]
Nyatakan kuantiti fizikal yang diukur oleh alat X.

.....

(iii) What will happen to the reading of device X if the piston of syringe is pushed in? [1 mark / markah]
Apakah yang akan berlaku kepada bacaan alat X jika omboh picagari ditolak masuk?

.....

(iv) What is the relationship between the physical quantity as shown by syringe and the X? [1 mark / markah]
Apakah hubungan antara kuantiti fizikal seperti ditunjukkan oleh picagari dan X?

.....

(c) Diagram 12.2 shows air was trapped in a beaker at the surface of water. The beaker is then pushed into the water until it sinks at a depth, *h*, as shown in Diagram 12.3.
Rajah 12.2 menunjukkan udara terperangkap di dalam sebuah bikar pada permukaan air. Bikar itu kemudiannya ditolak masuk ke dalam air sehingga kepada kedalaman, h, seperti yang ditunjukkan pada Rajah 12.3.

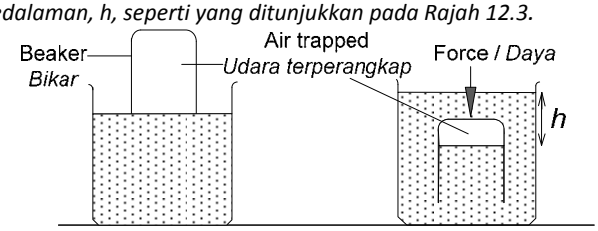


Diagram 12.2 / *Rajah 12.2* Diagram 12.3 / *Rajah 12.3*

(i) Name the type of pressure that acts on the surface of water. [1 *mark* / 1 *markah*]
Namakan jenis tekanan yang bertindak pada permukaan air.

.....

(ii) Using Diagram 12.2 and Diagram 12.3, compare the volume of trapped air in the beaker, the mass of trapped air in the beaker and the pressure of trapped air in the beaker. Relate the volume of trapped air in the beaker and its pressure to deduce a relevant physics concept. [5 *marks* / 5 *markah*]
Menggunakan Rajah 12.2 dan Rajah 12.3, bandingkan isipadu udara yang terperangkap di dalam bikar, jisim udara yang terperangkap dalam bikar dan tekanan udara dalam bikar. Hubungkaitkan di antara isipadu udara yang terperangkap dengan tekanannya untuk menyimpulkan satu konsep fizik yang relevan.

.....

.....

(iii) Based on Diagram 12.3, state and explain the motion of the beaker when the pushing force is removed.
Berdasarkan Rajah 12.3, nyatakan dan terangkan gerakan bikar apabila daya yang menolaknya ke bawah dilepaskan.
[4 *marks* / 4 *markah*]

.....

.....

QUESTION 13 MIRROR

13 Diagram 13.1 shows the condition of the image when a pencil is put in front of mirror X
Rajah 13.1 menunjukkan keadaan imej apabila satu pensel diletakkan di hadapan suatu cermin X.

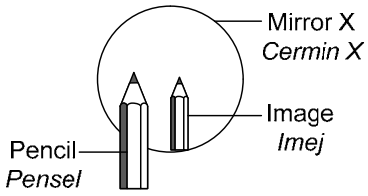


Diagram 13.1 / *Rajah 13.1*

(a) Name the phenomenon involved in the formation of the image. [1 mark / *markah*]
Namakan fenomenon yang terlibat dalam pembentukan imej itu.

……

(b) **(i)** Name the mirror *X*. [1 mark / *markah*]
Namakan cermin X.

……

(ii) Explain why mirror X is widely used in supermarket as surveillance mirror to view the unwanted activities by shoplifter? [1 mark / *markah*]
Terangkan mengapa cermin X digunakan meluas dalam supermarket sebagai cermin pemantau untuk memerhatikan aktiviti-aktiviti yang tidak diingini oleh pencuri?

……

(iii) The image formed in Diagram 13.1 is upright and diminished. State **one** other characteristics of the image.
*Imej yang terbentuk dalam Rajah 13.1 adalah tegak dan dibesarkan. Nyatakan **satu** ciri lain bagi imej itu.* [1 mark]

……

(iv) Diagram 13.2 shows an incomplete ray diagram. *C* is the centre of the curvature and *F* is the principal focus. Complete the ray diagram to show how the image is formed. [2 marks / markah]
Rajah 13.2 menunjukkan satu sinar rajah yang tidak lengkap. C ialah pusat kelengkungan dan F ialah fokus utama. Lengkapkan sinar rajah itu untuk menunjukkan bagaimana imej itu dibentuk.

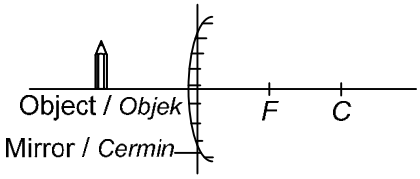


Diagram 13.2 / *Rajah 13.2*

(c) Diagram 13.3 shows a bulb is placed 3 m in front of a plane mirror and is observed by a student.
Rajah 13.3 menunjukkan satu mentol yang diletakkan pada 3 m di hadapan satu cermin satah dan diperhatikan oleh seorang pelajar.

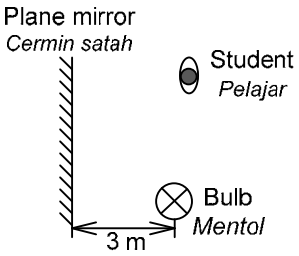


Diagram 13.3 / *Rajah 13.3*

(i) Name the phenomenon involved in the formation of the image on plane mirror. [1 mark / *markah*]
Namakan fenomenon yang terlibat dalam pembentukan imej itu pada cermin satah.

……

(ii) What is the distance of the image from the object? [2 marks / *markah*]
Berapakah jarak imej dari objek?

……

(iii) The student can see the image of the bulb in the plane mirror. In Diagram 13.3, draw a ray diagram to show how the student can see the image of the bulb. [2 marks / markah]
Pelajar itu boleh melihat imej mentol itu di dalam cermin satah. Pada Rajah 13.3, lukis satu rajah sinar untuk menunjukkan bagaimana pelajar itu boleh melihat imej mentol itu.

(iv) State **three** characteristics of the image formed. [3 marks / *markah*]
*Nyatakan **tiga** ciri bagi imej yang terbentuk.*

……

QUESTION 14 LENS

14 Diagram 14.1 shows the condition of the image seen through a lens *P*.
Rajah 14.1 menunjukkan keadaan imej yang dilihat menerusi sebuah kanta P.

Diagram 14.1 / *Rajah* 14.*1*

(a) Name the light phenomenon involved in Diagram 14.1. [1 mark / markah]
Namakan fenomenon cahaya yang terlibat dalam Rajah 14.1.

……

(b) The image formed in Diagram 14.1 is upright and virtual. State **one** other characteristics of the image.
*Imej yang terbentuk dalam Rajah 14.1 adalah tegak dan khayalan. Nyatakan **satu** ciri lain bagi imej itu.* [1 mark]

……

(c) On Diagram 14.2, draw a ray diagram to show how the image in Diagram 14.1 is formed. [2 marks / *markah*]
Pada Rajah 14.2, lukis satu sinar rajah untuk menunjukkan bagaimana imej di dalam Rajah 14.4 terbentuk.

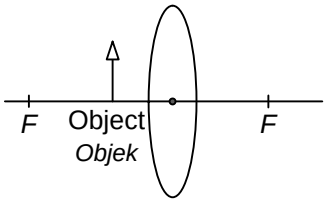
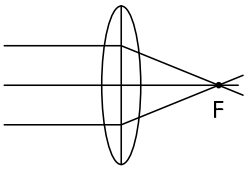
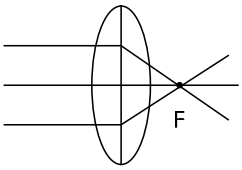


Diagram 14.2 / *Rajah 14.2*

(d) Diagram 14.3 and Diagram 14.4 show parallel rays are directed towards the lenses *P* and *Q* with focal point *F*.
Rajah 14.3 dan Rajah 14.4 menunjukkan sinar selari yang ditujukan kepada kanta P dan Q dengan titik fokus F.



Convex lens *P*
Diagram 14.3 / *Rajah 14.3*



Convex lens *Q*
Diagram 14.4 / *Rajah 14.4*

(i) What is meant by *focal point*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan titik fokus?

……

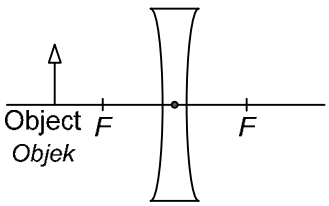
(ii) Using Diagram 14.3 and Diagram 14.4, compare the thickness and the focal length of the lens. Relate the thickness of the lens with the focal length to make a deduction regarding the relationship between thickness of the lens and the power of lens. [5 marks / *markah*]
Menggunakan Rajah 14.3 dan Rajah 14.4, banding ketebalan dan panjang fokus bagi kanta-kanta itu. Kaitkan ketebalan kanta dengan panjang fokus untuk membuat satu deduksi berhubung dengan hubungan antara ketebalan kanta dengan kuasa kanta.

……

……

……

(e) Complete the ray diagram below to show the formation of image. Hence, state **three** characteristics of the image
*Lengkapkah rajah sinar berikut untuk menunjukkan pembentukan imej. Kemudian, nyatakan **tiga** ciri bagi imej itu.*



Characteristics / *Ciri*: ……

QUESTION 15 SIGHTNESS PROBLEM

15 Diagram 15.1 shows the light rays passing through the eye lens when a person is having a myopia.
Diagram 15.2 shows the light rays passing through the eye lens when a person is having a hyper-metropia.
Rajah 15.1 menunjukkan sinar cahaya menerusi kanta mata apabila seseorang itu mengalami miopia.
Rajah 15.2 menunjukkan sinar cahaya menerusi kanta mata apabila seseorang itu mengalami hiper-metropia.

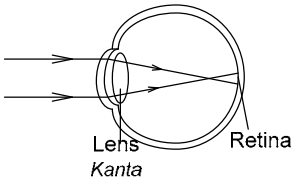


Diagram 15.1 / *Rajah 15.1*

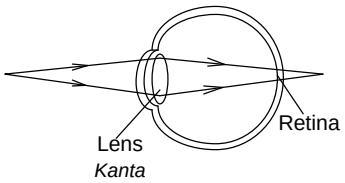


Diagram 15.2 / *Rajah 15.2*

(a) What is myopia and hyper-metropia? [2 marks / *markah*]
Apakah itu miopia dan hper-metropia?

……

(b) Name the light phenomenon involved in both diagrams. [1 mark / markah]
Namakan fenomenon cahaya terlibat dalam kedua-dua diagram.

……

(c) Based on Diagram 15.1 and Diagram 15.2, compare their object distance and image distance. Relate their object distance to the type of sight problem for both diagram and suggestion of lens used to correct the sightness.
Berdasarkan pada Rajah 15.1 dan Rajah 15.2, banding jarak objek dan jarak imej masing-masing. Hubungkan jarak objek kepada jenis masalah penglihatan untuk kedua-dua rajah dan cadangan mengatasi masalah penglihatan itu.[5 marks/ *markah*]

……

……

……

(d) By using your answer in **15**(g)(iii), draw the lens in the box provided and complete the ray diagram in Diagram 15.3 to show how myopia can be corrected.
Menggunakan jawapan anda di 7(g)(iii), lukis kanta di dalam kotak disediakan dan lengkapkan rajah sinar dalam Rajah 15.3 untuk menunjukkan bagaimana miopia boleh dibetulkan.

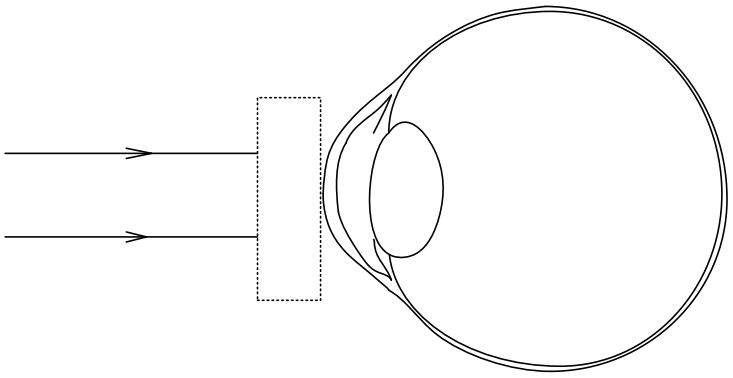


Diagram 15.3 / *Rajah 15.3*

(h) Diagram 15.4 shows a point *P* at the bottom of a swimming pool appears to be at the point *Q* to the observer.
Rajah 15.4 menunjukkan satu titik P pada dasar sebuah kolam renang yang kelihatan pada titik Q oleh pemerhati.

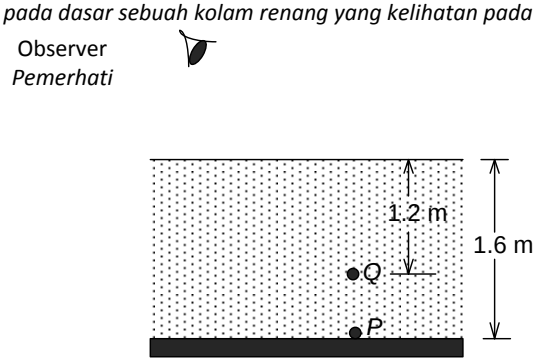


Diagram 15.4 / Rajah 15.4

(i) Complete Diagram 15.4 by drawing light rays to show how the image of the point *P* is seen at *Q*. [2 marks]
Lengkapkan Rajah 15.4 dengan melukiskan sinar cahaya untuk menunjukkan bagaimana titik P terlihat pada titik Q.

(ii) Calculate the refractive index of the water. [2 marks / *markah*]
Hitung index pembiasan bagi air itu.

QUESTION 16 OPTICAL FIBRE

16 Diagram 16.1 shows a light signal travelling through an optical fibre of glass.
Rajah 16.1 menunjukkan satu isyarat cahaya bergerak menerusi suatu gentian kaca optik.

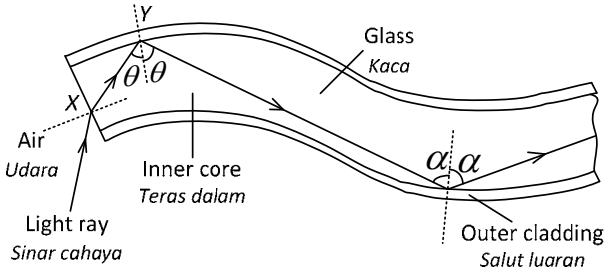


Diagram 16.1 / *Rajah 16.1*

(a) Name the light phenomenon involved at X and Y. [2 marks / *markah*]
Namakan fenomenon cahaya yang terlibat pada X dan Y.

X: ..... Y: .....

(b) State two changes that happen to the light ray when it passes from air into the optical fibre at *X*. [2 marks]
Nyatakan dua perubahan yang akan berlaku kepada sinar cahaya apabila ia bergerak dari udara ke dalam gentian optik pada X. [2 markah]

.....

(c) Explain why the light ray follows the path shown in Diagram 16.1 when it hits the wall of the optical fibre at *Y*. [2 marks / *markah*]
Terangkan mengapa sinar cahaya bergerak dalam lintasan ditunjukkan dalam Rajah 16.1 apabila ia menghentam dinding gentian optik pada Y.

.....

.....

(d) The optical fibre in Diagram 16.1 can be used in telecommunications and medicine. You are asked to investigate the characteristics of the type of glass in Table 16.1 which could be used to make the inner core of the optical fibre as in Diagram 16.1.
Gentian optik dalam Rajah 16.1 boleh digunakan dalam telekomunikasi dan perubatan. Anda diminta menyiasat ciri-ciri bagi jenis kaca dalam Jadual 16.1 yang boleh digunakan untuk membuat teras dalam suatu gentian optik seperti dalam Rajah 16.1.

Type of glass ***Jenis kaca***	**Refractive index** ***Indeks pembiasan***	**Density/kgm^{-3}** ***Ketumpatan/kgm^{-3}***	**Purity** ***Ketulenan***	**Strength and flexibility** ***Kekuatan dan fleksibiliti***
J	1.62	2400	Pure *Tulen*	Strong and rigid *Kuat dan tegar*
K	1.59	2300	Pure *Tulen*	Strong but flexible *Kuat dan fleksibel*
L	1.45	2450	Contains impurity *Tidak tulen*	Strong but flexible *Kuat dan fleksibel*
M	1.37	2500	Contains impurity *Tidak tulen*	Brittle *Rapuh*
N	1.20	3000	Pure *Tulen*	Strong and rigid *Kuat dan tegar*

Table 16.1 / *Jadual 16.1*

Explain the suitability of each characteristic in Table 16.1 and hence determine which type of glass is most suitable to be used to make the inner core of the optical fibre. Give reasons for your choice.
Terangkan kesesuaian setiap ciri dalam Jadual 16.1 dan kemudian tentukan jenis kaca yang manakah adalah paling sesuai digunakan untuk membuat teras dalam suatu gentian optik. Beri sebab untuk pilihan anda.

[10 marks / *markah*]

QUESTION 17 LIGHT (OPTICAL DEVICES)

17 **(a)** Diagram 17.1 shows a compound microscope.
Rajah 17.1 menunjukkan sebuah mikroskop majmuk.

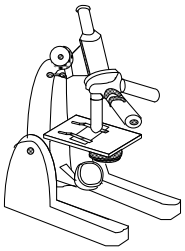


Diagram 17.1 / *Rajah 17.1*

Using an appropriate physics concept, suggest and explain suitable modifications or ways to enable the microscope to increase its efficiency to form a brighter and clear image. Your modifications can be emphasized on the following aspects:
Menggunakan konsep fizik yang sesuai, cadang dan terangkan pengubahsuaian atau cara untuk membolehkan mikroskop itu menambahkan kecekapannya untuk membentuk imej yang lebih terang dan jelas. Pengubahsuaian anda boleh berdasarkan pada aspek-aspek berikut:

· The selection of lens as objective lens and as an eyepiece / *Pemilihan kanta sebagai kanta objek dan kanta mata*
· The diameter of the lens / *Diameter kanta*
· The distance between the objective lens and eyepiece / *Jarak antara kanta objek dan kanta mata*
· Condition of the place to store the microscope / *Keadaan tempat untuk menyimpan mikroskop*
. Additional component to the microscope / *Komponen tambahan kepada mikroskop*

[10 marks / *markah*]

(b) Diagram 17.2 shows an astronomical telescope in normal adjustment. The power of objective lens is 2 D and the power of eyepiece is 20 D. The diameter of the objective lens is larger than the diameter of eyepiece.
Rajah 17.2 menunjukkan satu teleskop astronomi dalam pelarasan normal. Kuasa kanta objek ialah 2 D dan kuasa kanta mata ialah 20 D. Diameter kanta objek adalah lebih besar daripada diameter kanta mata.

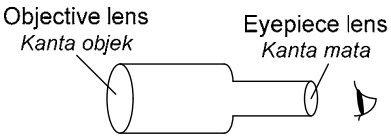


Diagram 17.2 / Rajah 17.2

(i) Why is the objective lens with bigger diameter used for the telescope? [1 mark / *markah*]
Mengapa kanta objek dengan diameter lebih besar digunakan untuk teleskop?

……

(ii) Calculate the focal length of the objective lens and also eyepiece lens. [2 marks / *markah*]
Hitung panjang fokus bagi kanta objek dan juga kanta mata.

(iii) Calculate the length of the telescope. [2 marks / *markah*]
Hitung panjang teleskop itu.

17 (c) Ali discovered that the astronomical telescope as above was not suitable to observe the distant object on the earth. He changed the position of the objective lens and eyepiece. He also added two similar optical components, D to obtain a better image. Diagram 17.3 shows a structure of optical device which was modified by Ali.

Ali mendapati bahawa teleskop astronomi di atas tidak sesuai untuk melihat objek jauh pada bumi. Dia mengubah kedudukan kanta objektif dan kanta mata. Dia juga menambahkan dua komponen optik yang serupa, D untuk mendapat imej yang lebih baik. Rajah 17.3 menunjukkan struktur bagi alat optik yang diubahsuai oleh Ali.

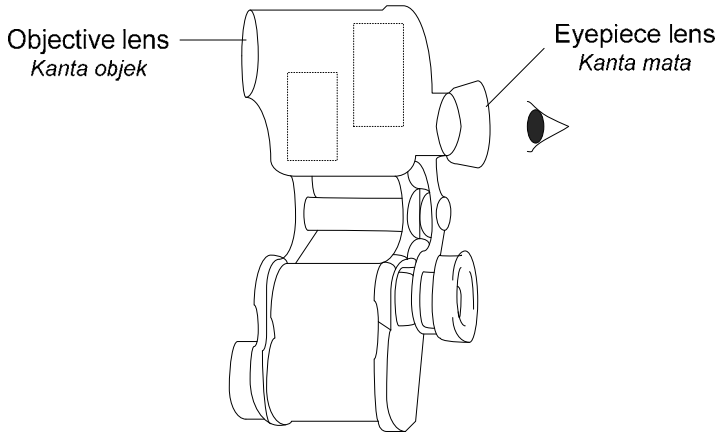


Diagram 17.3 / *Rajah 17.3*

(i) The binocular in Diagram 17.3 is more appropriate to be used to observe distant objects during camping activities. Explain. [2 marks / *markah*]

Binokular dalam Rajah 17.3 lebih sesuai digunakan untuk melihat objek jauh semasa aktiviti kempen. Terangkan.

.....

(ii) Name the additional optical component, *D*, that can be used to overcome the problem in **17**(c)(i). [1 mark]

*Namakan komponen optik tambahan, D, yang boleh digunakan untuk mengatasi masalah di **17**(c)(i).*

.....

(iii) Draw both additional optical components, *D*, inside the boxes provided in Diagram 17.3. [1 mark / *markah*]

Lukis kedua-dua komponen optik tambahan, D, dalam kotak disediakan dalam Rajah 17.3.

(iv) Complete the light ray that passes through the objective lens until it gets into the observer's eyes. [1 mark]

Lengkapkan sinar cahaya yang menerusi kanta objek sehingga ia sampai kepada mata pemerhati.

(v) State the light phenomenon that occurs in the additional optical component.[1 mark / markah]

Nyatakan fenomenon cahaya yang berlaku di dalam komponen optik tambahan itu.

.....

17 (d) Diagram 17.4 shows an astronomical telescope which is used to view very distant objects like moon.

Rajah 17.4 menunjukkan satu teleskop astronomi yang digunakan untuk melihat objet yang sangat jauh seperti bulan.

Diagram 17.4 / *Rajah 17.4*

Table 17.4 shows the characteristics of four different simple astronomical telescopes.

Jadual 17.4 menunjukkan cirri-ciri bagi empat teleskop astronomi ringkas yang berlainan

Telescope *Teleskop*	Type of lens *Jenis kanta*	Focal length of objective lens *Panjang fokus kanta objek*	Focal length of eyepiece lens *Panjang fokus kanta mata*	Diameter of lens *Diameter kanta*
S	Convex *Cembung*	40	10	5.0
T	Concave *Cekung*	10	40	5.0
U	Convex *Cembung*	10	40	2.5
V	Concave *Cekung*	40	10	2.5

Explain the suitability of each characteristic of the telescope and determine the most suitable telescope to be used to observe very far object. Give reason for your choice. [10 marks / *markah*]

Terangkan kesesuaian setiap ciri teleskop itu dan tentukan teleskop yang paling sesuai digunakan untuk melihat objek yang jauh. Beri sebab untuk pilihan anda.

17 (e) Diagram 17.5 shows a stamp collector examines a stamp using a magnifying glass.
Rajah 17.5 menunjukkan satu pengutip setem memeriksa satu setem dengan menggunakan kanta pembesar.

Diagram 17.5 / *Rajah 17.5*

Table 17.5 shows characteristics of four types of magnifying glass.
Jadual 17.5 menunjukkan ciri-ciri bagi empat jenis kanta pembesar.

Magnifying glass *Kanta pembesar*	Percentage of light transmitted (%) *Peratus cahaya dipindahkan (%)*	Type of lens *Jenis kanta*	Focal length (cm) *Panjang fokus (cm)*	Diameter (cm) *Diameter (cm)*
J	90	Convex *Cembung*	5.0	15.0
K	95	Concave *Cekung*	20.0	5.0
L	95	Convex *Cembung*	20.0	15.0
M	85	Concave *Cekung*	5.0	5.0

Table 17.5 / *Jadual 17.5*

17 (f) Diagram 17.6 shows a ray diagram of a slide projector.
Rajah 17.6 menunjukkan satu rajah sinar bagi satu projektor berslaid.

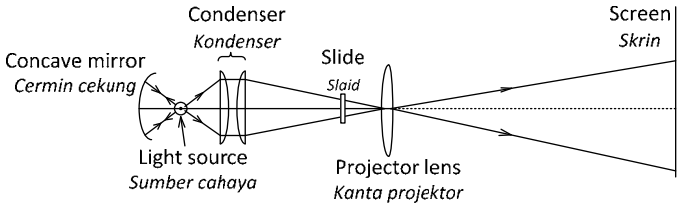
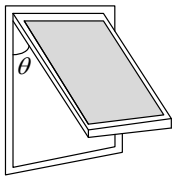


Diagram 17.6 / *Rajah 17.6*

The slide projector is needed in your school hall. You are required to modify the slide projector so that it can produce clearer image and can be seen by 800 students. Suggest and explain based on the following aspect:
Projektor berslaid itu diperlukan dalam dewan sekolah anda. Anda diminta mengubahsuai projektor berslaid itu supaya ia boleh menghasilkan imej yang jelas dan boleh dilihat oleh 800 murid. Cadang dan terangkan berdasarkan aspek berikut:
(i) The power of the bulb used / *Kuasa mentol yang digunakan*
(ii) The position of the bulb from the concave mirror / *Kedudukan mentol dari cermin cekung*
(iii) The curvature of the concave mirror / *Kelengkungan cermin cekung itu*
(iv) The position of the slide from the projector lens / *Kedudukan slaid daripada kanta projektor*
(v) Position of the screen from the projector / *Kedudukan skrin daripada projektor* [10 marks / *markah*]

17 (g) Diagram 17.7 shows a glass window which opens outwards at an angle θ.
Rajah 17.7 menunjukkan satu tingkap kaca yang dibuka keluar pada suatu sudut ϑ.



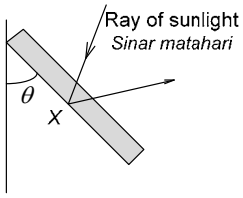


Diagram 17.7 / *Rajah 17.7* Diagram 17.8/ *Rajah 17.8*

Diagram 17.8 shows the side view of the window. If rays of sunlight incident on the window undergo total internal reflection at points like *X*, direct sunlight would not be able to enter the room and it would be cooler. Table 17.7 shows the characteristics of four designs *P*, *Q*, *R* and *S*.
Rajah 17.8 menunjukkan pandangan sisi sebuah tingkap. Jika sinar cahaya ditujukan kepada tingkap mengalami pantuhan dalam penuh pada titik X, cahaya akan tidak memasuki bilik dan bilik akan menjadi lebih sejuk.
Jadual 17.7 menunjukkan ciri-ciri bagi empat hiasan P, Q, R dan S.

Design *Corak*	Refractive index *Indeks pembiasan*	Thickness / mm *Ketebalan / mm*	Thermal conductivity *Kekonduksian terma*	Temperature, θ/°C *Suhu, ϑ/°C*
P	1.5	3.0	Low / *Rendah*	15
Q	1.8	5.0	Low / *Rendah*	10
R	1.8	3.0	Medium / *Sederhana*	15
S	1.5	5.0	Medium / *Sederhana*	10

Table 17.7 / *Jadual 17.7*

Explain the suitability of each characteristic of the glass and determine the most suitable design to be used so that the room would be kept cool during the day. Give reasons for your choice.
Terangkan kesesuaian setiap ciri kaca dan tentukan corak yang paling sesuai digunakan supaya bilik adalah sejuk sepanjang hari. Beri sebab untuk pilihan anda.

[10 marks / *markah*]

17 (h) Diagram 17.8 shows the ray diagram of a simple microscope.
Rajah 17.8 menunjukkan rajah sinar bagi suatu mikroskop ringkas.

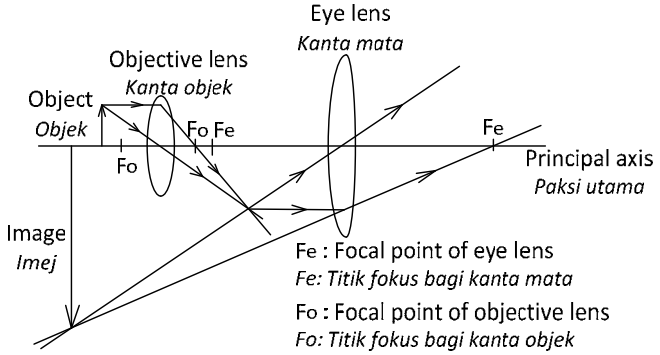


Diagram 17.8 / *Rajah 17.83*

(i) State the function of the eyepiece lens. [1 mark / *markah*]
Nyatakan fungsi bagi kanta mata.

.....

(ii) State the characteristics of the first image formed by an objective lens. [3 marks / *markah*]
Nyatakan ciri-ciri bagi imej yang terbentuk oleh kanta objek.

.....

(iii) State the characteristics of the final image which is formed by an eyepiece lens. [3 marks / *markah*]
Nyatakan ciri-ciri bagi imej akhir yang terbentuk oleh kanta mata.

.....

(iv) Suggest a way to increase the brightness of image formed by microscope. [1 mark / *markah*]
Cadang satu cara untuk menambahkan kecerahan imej yang terbentuk oleh mikroskop.

.....

QUESTION 18 LIGHT (OPTICAL DEVICES)

18 Table 18.1 shows the design of five torchlights *P*, *Q*, *R*, *S* and *T*.
Jadual 18.1 menunjukkan corak bagi lima lampu suluh P, Q, R, S dan T.

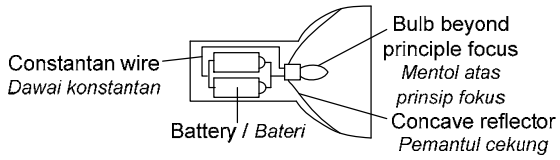
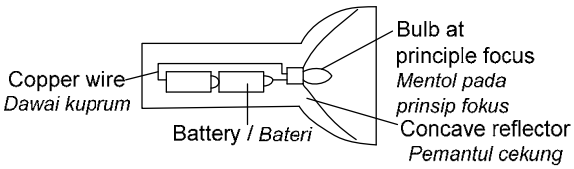
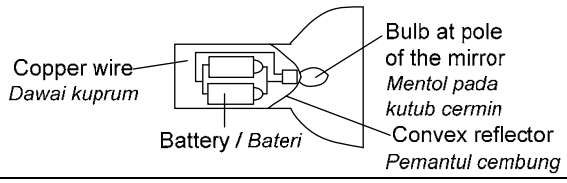
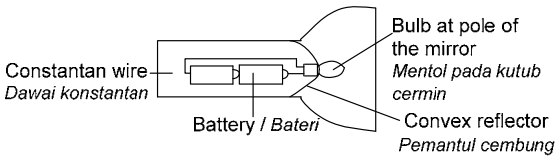
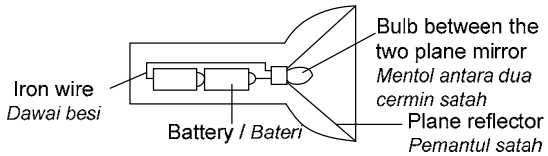
Torchlight *P* / *Lampu suluh P*  	Torchlight *S* / *Lampu suluh S* 
Torchlight *Q* / *Lampu suluh Q*  	Torchlight *T* / *Lampu suluh T* 
Torchlight *R* / *Lampu suluh R*  	

Table 18.1 / *Jadual 18.1*

You are asked to investigate the characteristics of the five torchlights shown in Table 18.1. Explain the suitability of each characteristics of the torchlight and determine the torchlight which can produce a strong parallel beam of light. Give reasons for your choice. [10 marks / *markah*]
Anda diminta menyiasat ciri-ciri bagi lima lampu suluh seperti dalam Jadual 18.1. Terangkan kesesuaian setiap cirri bagi lampu suluh dan tentukan lampu suluh yang boleh menghasilkan alur sinar selari yang kuat. Beri sebab untuk pilihan anda.

QUESTION 19 CONCEPT OF REFRACTION, CRITICAL ANGLE AND TOTAL INTERNAL REFLECTION

19 Diagram 19.1 shows a ray from ray box is incident toward a semicircular glass block which has the critical angle of 42°.
Rajah 19.1 menunjukkan satu sinar dari kotak sinar ditujukan kepada bongkah kaca semibulatan yang mempunyai sudut genting 42°.

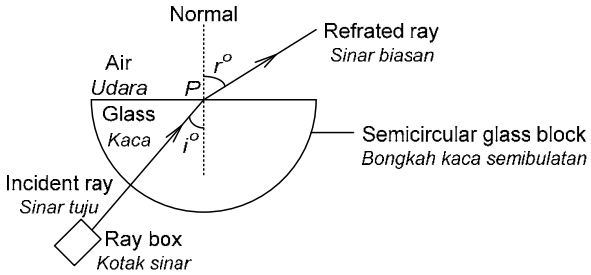


Diagram 19.1 / *Rajah 19.1*

(a) What is meant by *critical angle*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan sudut genting?

.....

(b) Calculate the refractive index of the semicircular glass block. [2 marks / *markah*]
Hitung indeks pembiasan bagi bongkah kaca semibulatan itu.

(b) In Diagram 19.1, the incident angle is 40° which is smaller than the critical angle.
Dalam Rajah 19.1, sudut tuju itu ialah 40° di mana ia lebih kecil daripada sudut genting.

(i) What will happen to the ray after refracted out from the glass? [1 mark / *markah*]
Apakah yang akan berlaku kepada sinaran selepas dibias keluar daripada kaca itu?

.....

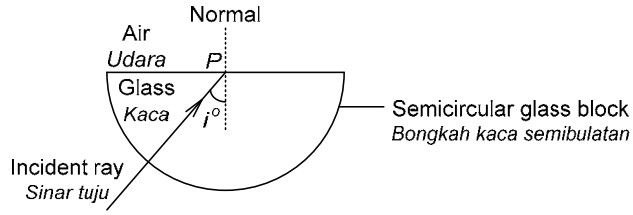
(ii) Calculate the value of *r*. [2 marks / *markah*]
Hitung nilai bagi r.

(c) The ray box in Diagram 19.1 is adjusted so that the incident angle, *i*° is at critical angle.
Kotak sinar dalam Rajah 19.1 diselaraskan supaya sudut tuju, i° adalah pada sudut genting.

(i) State what will happen to the value of *r*°? [1 mark / *markah*]
Nyatakan apa yang akan berlaku pada nilai bagi r°?

.....

(ii) Complete the ray in below after the point *P*. [1 mark / *markah*]
Lengkapkan sinaran itu dalam rajah bawah selepas titik P.

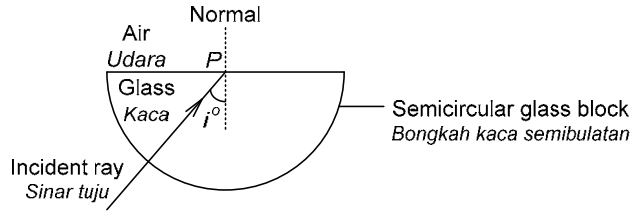


(c) The ray box in Diagram 19.1 is adjusted so that the incident angle, *i*° is more than the critical angle.
Kotak sinar dalam Rajah 19.1 diselaraskan supaya sudut tuju, i° adalah lebih besar daripada sudut genting.

(i) State what will happen to the value of *r*°? [1 mark / *markah*]
Nyatakan apa yang akan berlaku pada nilai bagi r°?

.....

(ii) Complete the ray in diagram below after the point *P*. [1 mark / *markah*]
Lengkapkan sinaran itu dalam rajah bawah selepas titik P.



(iii) Name the phenomenon involved in **19**(c)(ii). [1 mark / *markah*]
*Namakan fenomenon yang terlibat dalam **19**(c)(ii).*

.....

QUESTION 20 BERNOULLI' PRINCIPLE

20 **(a)** Diagram 20.1 shows an aeroplane. Diagram 20.2 shows a cross section of the aeroplane's wing.
Rajah 20.1 menunjukkan satu kapal terbang. Rajah 20.2 menunjukkan keratan rentas sayap kapal.


Diagram 20.1 / *Rajah 20.1* Diagram 20.2 / *Rajah 20.2*

(i) State the principle involved for the flying of aeroplane. [1 mark / *markah*]
Nyatakan prinsip yang terlibat untuk penerbangan kapal terbang.

.....

(ii) Explain the principle you state in **20**(a)(i). [1 mark / *markah*]
*Terangkan prinsip yang anda nyatakan dalam **20**(a)(i).*

.....

.....

(iii) Name the shape of the cross sectional of the aeroplane wing. [1 mark / *markah*]
Namakan bentuk keratan rentas bagi sayap kapal terbang.

.....

(iv) Explain how an aeroplane can be lifted into the air. [5 marks / markah]
Terangkan bagaimana satu kapal terbang boleh dinaikkan ke udara.

.....

.....

.....

(b) Table 20.1 shows characteristic of four designs of the aeroplane wings.
Jadual 20.1 menunjukkan ciri bagi empat corak sayap kapal terbang.

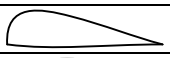
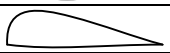
Design *Corak*	Shape of wing *Bentuk sayap*	Area of wings *Luas sayap*	Density of wing (kgm^{-3}) *Ketumpatan sayap (kgm^{-3})*	Different of air speed above and below the wing (ms^{-1}) *Beza laju udara atas dan bawah sayap (ms^{-1})*
W		38.0	2400	0.0
X		39.7	2300	21.8
Y		60.5	2000	20.0
Z		40.5	2050	15.5

Table 20.1 / *Rajah 20.1*

You are requested to choose the most suitable wing to be installed to the body of an aeroplane. By referring to the information given in Table 20.1, explain the suitability of each characteristic and suggest the most suitable wing to be chosen. Give reason for your choice. [10 marks / *markah*]
Anda diminta menentukan sayap yang paling sesuai untuk dipasang pada badan kapal terbang. Dengan merujuk kepada maklumat diberi dalam Jadual 20.1, terangkan kesesuaian setiap ciri dan cadang sayap yang paling sesuai. Beri sebab untuk pilihan anda.

20 **(c)** Diagram 20.3 shows a water rocket made from an empty 1.5 litre plastic soft drink bottle by adding water and pressurizing it with air for launching.

Rajah 20.3 menunjukkan satu roket air yang diperbuat daripada suatu minuman botol 1.5 liter dengan menambahkan air dan memberikan tekanan kepadanya untuk dilancarkan.

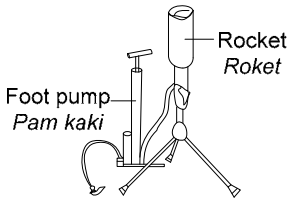


Diagram 20.3 / *Rajah 20.3*

The objective is to travel the rocket as far as possible. Using the appropriate physics concepts, suggest and explain the following aspects:

Objektif ini ialah untuk menggerakkan roket sejauh yang mungkin. Dengan menggunakan konsep fizik, cadang dan terangkan aspek-aspek berikut:

(i) The shape of the rocket / *Bentuk roket*

(ii) The volume of water to be filled to the bottle / *Isipadu air yang perlu diisi ke dalam botol*

(iii) The stability of the motion / *Kestabilan pergerakan*

(iv) Density of material to the rocket / *Ketumpatan bahan kepada roket*

(v) Angle of launching / *Sudut pelancaran*

[10 marks / *markah*]

(d) Diagram 20.4 shows four racing cars, *P*, *Q*, *R* and *S*, with different specifications.

Rajah 20.4 menunjukkan empat kereta lumba, P, Q, R dan S dengan spesifikasi berlainan.

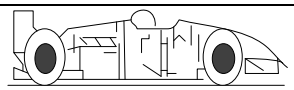
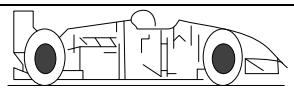
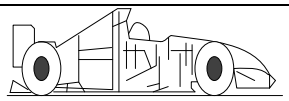
Car ***Kereta***	**Shape** ***Bentuk***	**Ridges on tyre** ***Bunga pada tayar***	**Engine power** ***Kuasa enjin***	**Material for the car body** ***Bahan badan kereta***
P	 Aerodynamics *Aerodinamik*	Horizontal and vertical *Horizontal dan vertikal*	518 kW	Light and elastic *Ringan dan elastik*
Q	 Aerodynamics *Aerodinamik*	None *Tiada*	745 kW	Heavy and stiff *Berat dan keras*
R	 Inverted aerofoil *Aerofoil songsang*	Horizontal and vertical *Horizontal dan vertikal*	518 kW	Heavy and elastic *Berat dan elastik*
S	 Inverted aerofoil *Aerofoil songsang*	None *Tiada*	745 kW	Light and stiff *Ringan dan keras*

Diagram 20.4 / *Rajah 20.4*

You are required to investigate the specifications given so that the car can run very fast. Determine the most suitable car to compete in the Formula 1 Race and justify your choice.

Anda diminta untuk menyiasat spesifikasi diberi supaya kereta itu boleh bergerak dengan sangat laju. Tentukan kereta yang paling sesuai untuk bertanding dalam Perlumbaan Formula 1 dan justifikasi pilihan anda.

[10 marks / *markah*]

QUESTION 21 ARCHIMEDES' PRINCIPLE

21 Diagram 21.1 shows the air balloon which is used as a weather balloon to carry a radiosonde instrument for collecting data about the atmosphere.
Rajah 21.1 menunjukkan belon udara yang digunakan sebagai belon cuaca untuk membawa pengukur radiosond bagi mengumpul data berkaitan dengan atmosfera.

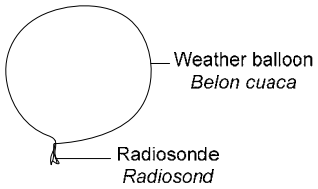


Diagram 21.1 / *Rajah 21.1*

(a) **(i)** State the meaning of Archimedes' principle. [1 mark / *markah*]
Nyatakan maksud prinsip Archimedes.

.....

.....

(ii) Explain why a weather balloon that is rising up in the air will stop at certain altitude. [4 marks / *markah*]
Terangkan mengapa satu belon cuaca yang naik ke udara akan berhenti pada altitud tertentu.

.....

.....

(b) Table 21.1 shows four hot air balloons *P*, *Q*, *R* and *S* with different features.
Jadual 21.1 menunjukkan empat belon udara panas P, Q, R dan S dengan ciri berlainan.

Balloon *Belon*	Size and volume *Saiz dan isipadu*	Number of burners *Bilangan pembakar*	Type of balloon fabric *Jenis fabrik belon*	Temperature of air inside *Suhu udara dalam*
P	Small and 800 m^3 *Kecil dan 800 m^3*	1	Synthetic nylon *Nilon sintetik*	100˚C
Q	Large and 2500 m^3 *Besar dan 2500 m^3*	2	Synthetic nylon *Nilon sintetik*	120˚C
R	Large and 2500 m^3 *Besar dan 2500 m^3*	1	Canvas *Kanvas*	60˚C
S	Small and 800 m^3 *Kecil dan 800 m^3*	2	Canvas *Kanvas*	70˚C

Table 21.1 / Jadual 21.1

You are required to investigate the hot air balloon which is able to carry three or four people to a higher altitude in a shorter time. Determine the most suitable balloon dan justify your choice.
Anda diperlukan untuk menyiasat belon udara panas yang boleh digunakan untuk membawa tiga atau empat orang ke altitud tinggi dalam masa yang singkat. Tentukan belon yang paling sesuai dan justifikasi pilihan anda.

[10 marks / *markah*]

(c) Diagram 21.2 shows a balloon which contains helium. The volume of the balloon is 1.2 m^3 and the density of helium gas is 0.18 kgm^{-3}.
Rajah 21.2 menunjukkan satu belon yang mengandungi helium. Isipadu belon itu ialah 1.2 m^3 dan ketumpatan gas helium ialah 0.18 kgm^{-3}.

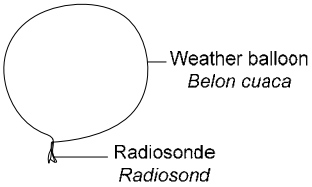


Diagram 21.2 / *Rajah 21.2*

(i) By neglecting the mass of the balloon, calculate the mass of helium gas in the balloon. [2 marks / *markah*]
Dengan mengabaikan jisim belon, hitung jisim gas helium di dalam belon itu.

(ii) Calculate the buoyant force which acts on the balloon. The density of air is 1.3 kg m^{-3}. [3 marks / *markah*]
Hitung daya apungan yang bertindak pada belon itu. Ketumpatan udara ialah 1.3 kgm^{-3}.

21 **(d)** Diagram 21.3 shows a submarine floating in sea water due to the effect of buoyant force.
Rajah 21.3 menunjukkan satu kapal selam yang terapung di dalam air laut disebabkan oleh kesan daya apungan.

Diagram 21.3 / *Rajah 21.3*

(i) What is the meaning of *buoyant force*? [1 mark / *markah*]
Apakah yang dimaksudkan oleh daya apungan?

.....

(ii) Explain how a submarine is able to submerge into deep sea water. [4 marks / *markah*]
Terangkan bagaimana satu kapal selam berupaya tenggelam jauh ke dalam air laut.

.....

.....

.....

(iii) You are asked to investigate the characteristics of four submarines shown in Table 21.2.
Anda diminta menyiasat ciri-ciri bagi empat kapal selam yang ditunjukkan dalam Jadual 21.2.

Volume of ballast tank *Isipadu tangki balast*	Number of air tank *Bilangan tangki udara*	Maximum pressure to be tolerated *Tekanan maksimum boleh berinteraksi*	Shape of submarine *Bentuk kapal selam*
3 000 litre	15	4.5 atm	
2 500 litre	30	6.0 atm	
350 litre	3	6.1 atm	
400 litre	1	2.0 atm	

Table 21.2 / *Jadual 21.2*

Explain the suitability of each characteristic of the submarines and determine the submarine which can travel faster, stay longer in deeper sea water and able to carry more crew. Give reasons for your choice.
Terangkan kesesuaian setiap ciri kapal selam dan tentukan kapal selam yang manakah dapat bergerak dengan lebih laju, tahan lama di dalam air laut dan boleh membawa banyak krew. Beri sebab untuk pilihan anda.

[10 marks / *markah*]

(e) Diagram 21.4 shows oil drum floats stationary in water. The density of water is 1000 kg m^{-3}.
Rajah 21.4 menunjukkan drum minyak terapung secara statik di dalam air. Ketumpatan air ialah 1000 kg m^{-3}.

Diagram 21.4 / *Rajah 21.4*

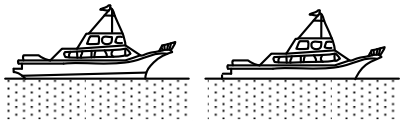
Calculate / *Hitung*

(i) The volume of the oil drum immersed in water / *Isipadu drum minyak terendam dalam air*. [2 marks / *markah*]

(ii) The buoyant force acting on the oil drum / *Daya apungan bertindak pada drum minyak*. [2 marks / *markah*]

(iii) The mass of the oil drum / *Jisim drum minyak itu*. [1 mark / *markah*]

21 **(e)** Diagram 21.5 shows two boats of the same weight floating on the surface of water in the sea and in the river.
Rajah 21.5 menunjukkan dua kapal dengan berat yang sama terapung pada permukaan air dalam laur dan sungai.



Sea / *Laut* River / *Sungai*
Diagram 21.5 / *Rajah 21.5*

(i) Name the principle applied for the floating of the boat. [1 mark / *markah*]
Namakan prinsip yang diaplikasikan untuk pengapungan kapal.

……

(ii) Explain why the boat is able to float? [2 marks / *markah*]
Terangkan mengapa kapal itu boleh terapung?

……

……

(iii) Deduce the relationship between the weight of the ship and the weight of the water displaced. [1 mark]
Deduksikan hubungan antara berat kapal dan berat air yang disesarkan. [1 markah]

……

(iv) A ship that travels round the world will has Plimsoll symbol as shown in Diagram 21.6.
Satu kapal yang bergerak mengeliling dunia mempunyai simbol Plimsoll seperti ditunjukkan dalam Rajah 21.6.

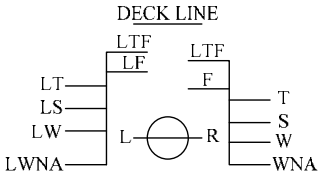


Diagram 21.6 / *Rajah 21.6*

State the common function of the Plimsoll line. [1 mark / *markah*]
Nyatakan fungsi biasa bagi garis Plimsoll itu.

……

……

(v) You are required to give some suggestions on how to design the boat in Diagram 21.5 as to increase the floating force and safer. Explain the suggestions based on the following aspects:
Anda diminta memberi beberapa cadangan bagaimana merekabentuk kapal dalam Rajah 21.5 supaya bertambah daya apungan dan lebih selamat. Terangkan cadangan-cadangan berdasarkan aspek berikut:
-Material used, shape of boat, density of boat, additional components, safety feature [10 marks / *markah*]
-Bahan digunakan, bentuk kapal, ketumpatan kapal, komponen tambahan, ciri keselamatan

QUESTION 22 PASCAL'S PRINCIPLE

22 Diagram 22.1 shows a hydraulic lift used to raise loads *Q* and *R*.
Rajah 22.1 menunjukkan satu lif hidraulik yang digunakan untuk menaikan beban Q dan R.

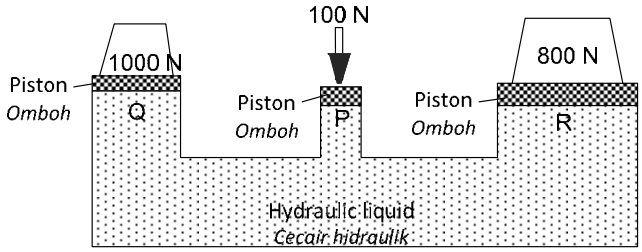


Diagram 22.1 / *Rajah 22.1*

(a) **(i)** What is meant by *pressure*? [1 mark / *markah*]
Apakah yang dimaksudkan dengan tekanan?

……

(ii) A force of 100 N is used to push down piston *P* and able to raise piston *Q* and piston *R*. With reference to Diagram 22.1, compare the pressure acted on piston *Q* and *R*, the cross sectional area and the force produced at the piston *Q* and piston *R*. Relate the cross sectional area of the pistons with the force produced on the pistons. Name a physics principle relating the cross sectional area and the force exerted on pistons *Q* and *R*. [5 marks / *markah*]
Satu daya 100 N digunakan untuk menolak turun omboh P dan boleh menaikkan omboh Q dan omboh R. dengan merujuk kepada Rajah 22.1, banding tekanan bertindak pada omboh Q dan R, luas keratan rentas dan daya terhasil pada omboh Q dan omboh R. Kaitkan luas keratan rentas omboh dengan daya yang terhasil pada omboh-omboh. Namakan satu prinsip fizik berhubung dengan luas keratan rentas dan daya bertindak pada omboh Q dan R.

……

……

……

(b) Diagram 22.2 shows the brake system of a car.
Rajah 22.2 menunjukkan sistem brek bagi sebuah kereta.

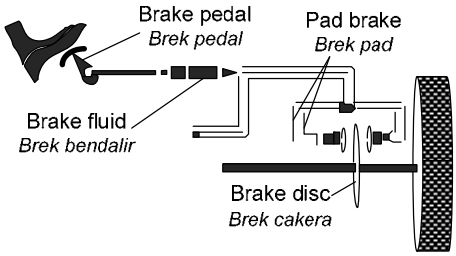


Diagram 22.2 / *Rajah 22.2*

(i) State the physics principle involved in the operation of the brake system. [1 mark / *markah*]
Nyatakan prinsip fizik yang terlibat dalam operasi sistem brek.

……

(ii) Define the principle you stated in **22**(b)(i). [1 mark / *markah*]
*Takrifkan prinsip yang anda nyatakan di **22**(b)(i).*

……

……

(iii) Why the water is not suitable to be used in the braking system? [1 mark / *markah*]
Mengapa air tidak sesuai digunakan dalam sistem brek?

……

(e) Explain why the slave piston has bigger surface area if compared to the master piston built on the peddle brake? [1 mark / *markah*]
Terangkan mengapa omboh hamba mempunyai luas permukaan yang lebih besar jika dibandingkan dengan omboh master yang dibina pada brek pedal?

……

(f) If a force of 50 N is applied on brake pedal of cross-sectional area 2 cm^2. Calculate the output force produced on the brake pad of cross-sectional area 15 cm^2.
Jika satu daya 50 N diaplikasikan pada brek pedal yang mempunyai luas keratan rentas 2 cm^2. Hitung daya output dihasilkan pada brek pad yang mempunyai luas keratan rentas 15 cm^2.

22 **(c)** Table 22.1 shows the specifications of components that can be used in brake systems, *P*, *Q*, *R* and *S*.
Jadual 22.1 menunjukkan spesifikasi bagi komponen-komponen yang digunakan dalam sistem brek P, Q, R dan S.

Brake *Brek*	Specific heat capacity of brake disc (J $kg^{-1}°C^{-1}$) *Muatan haba tentu brek cakera (J $kg^{-1}°C^{-1}$)*	Melting point of brake disc (°C) *Takat lebur bagi brek disk (°C)*	Compression of brake fluid *Ketermampatan bagi cecair brek*	Hardness of brake pads *Kekerasan bagi brek pad*
P	360	930	Easy / *Senang*	Low / *Rendah*
Q	2400	1220	Difficult / Susah	Low / *Rendah*
R	890	580	Easy / *Senang*	High / *Tinggi*
S	2210	1940	Difficult / Susah	High / *Tinggi*

Table 22.1 / *Jadual 22.1*

Based on Table 22.1, you are required to determine the most suitable brake system and explain the suitability of the aspects given. Then, justify your choice. [10marks / *markah*]
Berdasarkan pada Jadual 22.1, anda diperlukan untuk menentukan sistem brek yang paling sesuai dan terangkan kesesuaian dari aspek diberi. Kemudian, justifikasikan pilihan anda.

(d) Diagram 22.3 shows a simple hydraulic jack being used to lift load.
Rajah 22.3 menunjukkan satu jet hidraulik ringkas yang digunakan untuk mengangkat beban.

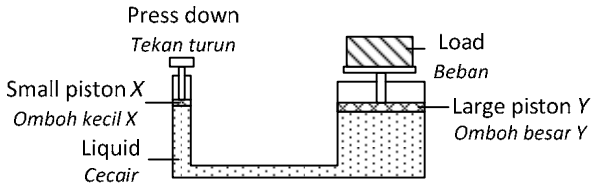


Diagram 22.3 / *Rajah 22.3*

Table 22.2 shows the characteristics of four of hydraulic jack.
Jadual 22.3 menunjukkan cirri-ciri bagi empat jenis jet hidraulik.

Hydraulic jack *Jet hidraulik*	Liquid *Cecair*	Ratio of size of pistons *Nisbah saiz omboh-omboh*	Distance between pistons *Jarak antara omboh*	Hardness of hydraulic jack *Kekerasan jet hidraulik*
P	Water / *Air*	Big / *Besar*	Far / *Jauh*	Soft / *Lembut*
Q	Water / *Air*	Small / *Kecil*	Near / *Dekat*	Hard / *Keras*
R	Oil / *Minyak*	Big / *Besar*	Near / *Dekat*	Hard / *Keras*
S	Oil / *Minyak*	Small / *Kecil*	Far / *Jauh*	Soft / *Lembut*

Table 22.2 / *Jadual 22.2*

Explain the suitability of the characteristics of the hydraulic jack that can be used to lift heavy loads effectively in short time. Determine the most suitable hydraulic jack to be used and justify your choice. [10 marks / *markah*]
Terangkan kesesuaian ciri-ciri bagi jet hidraulik yang boleh digunakan untuk mengangkat beban berat dengan berkesan dalam masa yang singkat. Tentukan jet hidraulik yang paling sesuai digunakan dan justifikasikan pilihan anda.

QUESTION 23 ELECTRICITY AND OHM'S LAW

23 Diagram 23.1 shows a filament bulb labelled "240 V, 80 W". Diagram 23.2 shows a graph of potential difference against current for two materials, *Y* and *Z*. One of the materials will be chosen as filament in a bulb.
Rajah 23.1 menunjukkan satu mentol filamen berlabel "240 V, 80 W". Rajah 23.2 menunjukkan satu graf beza keupayaan melawan arus bagi dua bahan, Y dan Z. Satu daripada bahan itu akan dipilih sebagai filamen dalam mentol.

Diagram 23.1 / *Rajah 23.1*

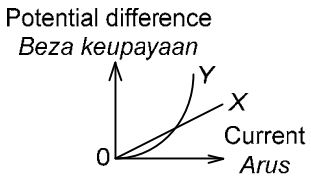


Diagram 23.2 / *Rajah 23.2*

(a) **(i)** Define Ohm's law. [1 mark / *markah*]
Takrifkan hukum Ohm.

……

……

(ii) What is meant by "240 V, 80 W?" [1 mark / *markah*]
Apakah yang dimaksudkan oleh "240 V, 80 W"?

……

……

(b) Based on the graph in Diagram 23.2, compare the resistance of materials *Y* and *Z*. Choose the more suitable material to use as a filament of the bulb. Explain your choice. [4 marks / markah]
Berdasarkan pada graf dalam Rajah 23.2, bandingkan rintangan bagi bahan Y dan Z. Pilih bahan yang paling sesuai digunakan sebagai filamen mentol. Terangkan jawapan anda.

……

……

(c) As a researcher, your duty is to study the characteristics of a material to make a heating element of a water heater. You are given four choices of heating elements *J*, *K*, *L* and *M*. Table 23.1 shows the characteristics of the four heating elements.
Sebagai seorang penyelidik, tugas anda ialah mengkaji ciri-ciri bagi satu bahan untuk membuat unsur pemanas dalam pemanas air. Anda diberi empat pilihan bagi unsur pemanas J, K, L dan M. Jadual 23.1 menunjukkan ciri-ciri bagi empat unsur pemanas itu.

Heating element *Unsur pemanas*	Cross sectional area *Luas keratan rentas*	Melting point *Takat lebur*	Specific heat capacity *Muatan haba tentu*	Length of wire *Panjang wayar*
J	Small / *Kecil*	Low / *Rendah*	High / *Tinggi*	Long / *Panjang*
K	Large / *Besar*	High / *Tinggi*	Low / *Rendah*	Short / *Pendek*
L	Small / *Kecil*	High / *Tinggi*	Low / *Rendah*	Long / *Panjang*
M	Large / *Besar*	Low / *Rendah*	High / *Tinggi*	Short / *Pendek*

Table 23.1 / *Jadual 23.1*

You are required to determine the most suitable heating element. Study the specifications of all the four heating elements and then justify your choice. [10 marks / *markah*]
Anda diminta untuk menentukan unsur pemanas yang paling sesuai. Kaji spesifikasi bagi semua unsur pemanas dan justifikasikan pilihan anda.

(d) Define the meaning of current. [1 mark / *markah*]
Takrifkan maksud arus.

……

QUESTION 24 RESISTANCE AND HEATING ELEMENT

24 **(a)** Diagram 24.1 shows the incomplete set-up of an experiment used by a student to investigate how the current flowing in a resistor varies with the potential difference across it.

Rajah 24.1 menunjukkan satu eksperimen pemasangan tak lengkap yang digunakan oleh seorang pelajar untuk menyiasat bagaimana arus mengalir dalam satu perintang yang berubah dengan beza keupayaan merentasinya.

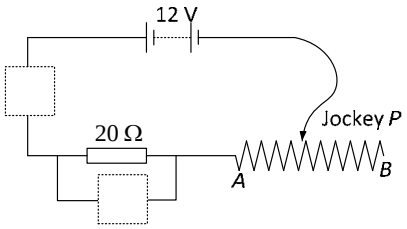


Diagram 24.1 / *Rajah 24.1*

By using an appropriate symbol, complete the diagram by putting the ammeter and voltmeter. [2 marks / *markah*]

Dengan menggunakan simbol yang sesuai, lengkapkan rajah dengan meletakkan ammeter dan voltmeter.

(b) Diagram 24.2 shows a rheostat / *Rajah 24.2 menunjukkan satu reostat.*

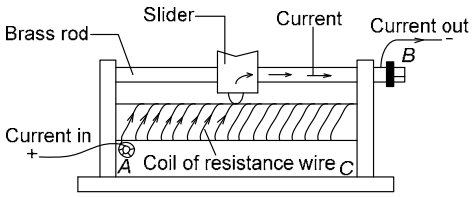


Diagram 24.1 / *Rajah 24.2*

(i) What is the function of the rheostat / *Apakah fungsi reostat?*? [1 mark / *markah*]

.....

(ii) State one factor which affects the changes of the resistance in the rheostat. [1 mark / *markah*]

Nyatakan satu faktor yang mempengaruhi perubahan rintangan dalam reostat.

.....

(iii) Explain the working principle of the rheostat. [5 marks / *markah*]

Terangkan prinsip kerja reostat.

.....

.....

.....

(iv) What will happen if a student connects the rheostat to Ohm's law circuit through A and C?[1 mark/*markah*]

Apakah yang akan berlaku jika seorang pelajar menyambungkan reostat itu ke litar hukum Ohm menerusi A dan C?

.....

(c) Diagram 24.3 shows an electric kettle used to boil water.

Rajah 24.3 menunjukkan satu cerek elektrik yang digunakan untuk mendidih air.

Diagram 24.3 / *Rajah 24.3*

Table 24.3 shows the specifications of four wires of the same diameter that can be used as a heating element of an electric kettle.

Jadual 24.3 menunjukkan spesifikasi bagi empat wayar yang mempunyai diameter yang sama yang boleh digunakan sebagai unsur pemanas suatu cerek elektrik.

Type *Jenis*	Density (kgm^{-3}) *Ketumpatan (kgm^{-3})*	Melting point (°C) *Takat lebur (°C)*	Oxidation rate *Kadar pengaratan*	Resistivity (Ωm) *Kerintangan (Ωm)*
P	6500	7500	High / *Tinggi*	8.0×10^{-7}
Q	7000	8050	High / *Tinggi*	7.0×10^{-7}
R	5000	8500	Low / *Rendah*	5.0×10^{-7}
S	2500	9000	Low / *Rendah*	8.0×10^{-7}

Table 24.3 / Jadual 24.3

You are required to determine the most suitable wire and explain the suitability of the characteristics given in the Table 24.3. [10 marks / *markah*]

Anda diminta untuk menentukan wayar yang paling sesuai dan terangkan kesesuaian ciri-ciri dalam Jadual 24.3.

QUESTION 25 ELECTRICITY AND HEATING ELEMENT

25 Diagram 25.1 and Diagram 25.2 show two circuits. Each circuit contains an ammeter, 4 cells, rheostat and a filament lamp labelled 6 V, 24 W. Diagram 25.3 and Diagram 25.4 show the thickness of coiled wire of filament lamp *M* and *N* respectively.

Rajah 25.1 dan Rajah 25.2 menunjukkan dua litar. Setiap litar mengandungi satu ammeter, 4 sel, reostat dan satu lampu filamen berlabel 6 V, 24 W. Rajah 25.3 dan Rajah 25.4 menunjukkan ketebalan gegelung wayar bagi lampu filamen M dan N masing-masing.

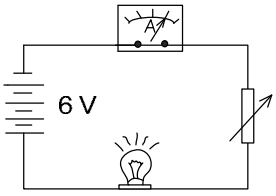


Diagram 25.1 / *Rajah 25.1*

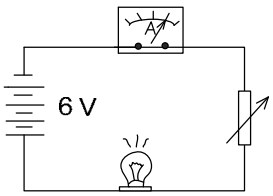


Diagram 25.2 / *Rajah 25.2*

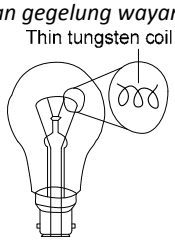


Diagram 25.3: Lamp M / *Lampu M*

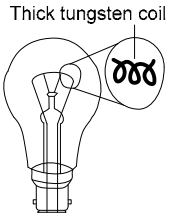


Diagram 25.4: Lamp *N*

(a) What is the meaning of the labelled "6V, 24W" on the filament lamp? [1 mark / *markah*]

Apakah maksud label "6 V, 24 W" pada lampu filamen.

……

(b) Observe Diagram 25.1 and Diagram 25.2. Compare the reading of the ammeter and the brightness of the filament lamp *M* and *N* and compare the thickness of coiled wire of the filament lamps. Relate the brightness of the filament lamp with the thickness of coiled wire to make a deduction on the relationship between thickness of coil wire and the heat produced by the filament lamp. [5 marks / *markah*]

Perhatikan Rajah 25.1 dan Rajah 25.2. Banding bacaan pada ammeter dan kecerahan lampu filamen M dan N dan banding ketebalan gegelung wayar pada lampu filamen. Kaitkan kecerahan lampu filamen dengan ketabalan wayar gegelung untuk membuat satu kesimpulan pada hubungan antara ketebalan gegelung wayar dan haba dihasilkan oleh lampu filamen.

……

……

……

……

(c) Diagram 25.5 shows two types of plug for the electric kettle that can be connected to the electric supply. Diagram 25.5(a) uses two pin plugs, while Diagram 25.5(b) uses a three pin plug with an earth wire.

Rajah 25.5 menunjukkan dua jenis plag untuk cerek elektrik yang disambungkan ke bekalan elektrik. Rajah 25.5(a) menggunakan plag dua pin manakala Rajah 25.5(b) menggunakan plag 3 pin dengan wayar bumi.

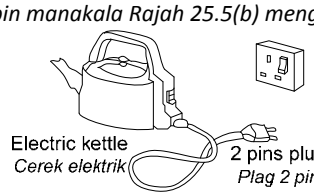


Diagram 25.5(a) / *Rajah 25.5(a)*

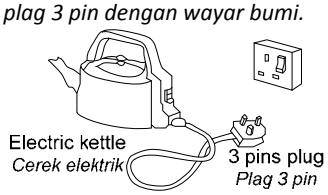


Diagram 25.5(b) / *Rajah 25.5(b)*

Explain why a three pin plug is more suitable compared with a two pins plug. [4 marks / *markah*]

Terangkan mengapa plag 3 pin adalah lebih sesuai berbanding dengan plag 2 pin.

……

……

(d) Diagram 25.6 shows a water heater used to boil water.

Rajah 25.6 menunjukkan satu pemanas air yang digunakan untuk mendidih air.

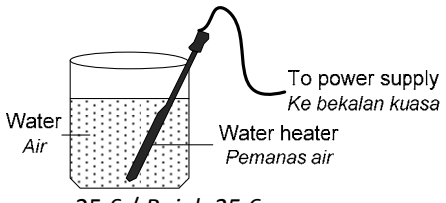


Diagram 25.6 / *Rajah 25.6*

Using appropriate physics concepts, suggest and explain how to build a water heater which can boil a larger quantity of water faster , more efficient, and more safety based on the following aspects:

Menggunakan konsep fizik yang sesuai, cadang dan terangkan bagaimana membina satu pemanas air yang boleh mendidih kuantiti air yang banyak dengan cepat, lebih effisien dan lebih selamat berdasarkan aspek berikut:

(i) type of material of the heating element / *Jenis bahan bagi unsur pemanas*

(ii) shape of the heater / *Bentuk pemanas*

(iii) melting point of the heating element / *Takat lebur bagi unsur pemanas*

(iv) rate of rusting of the heating element / *Kadar pengaratan bagi unsur pemanas*

(v) additional component used for safety / *Komponen tambahan digunakan untuk keselamatan* [10 marks / *markah*]

QUESTION 26 ELECTRICITY AND HEATING ELEMENT

26 (a) Diagram 26.1 shows a 240 V, 1200 W electrical kettle.
Rajah 26.1 menunjukkan satu cerek elektrik 240 V, 1200 W.

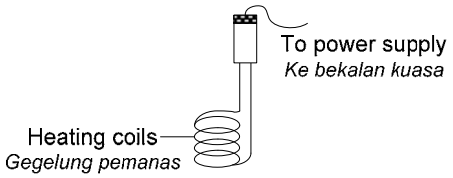


Diagram 26.1 / *Rajah 26.1*

(i) Name one suitable material which can be used to produce the heating coil of the heater. State one reason for your choice. [2 marks / *markah*]
Namakan satu bahan yang sesuai yang boleh digunakan untuk menghasilkan gegelung pemanas itu. Berikan satu sebab untuk pilihan anda.

……

(ii) The electrical heater is connected to a 240 V power supply.
Calculate the current that flows through the heater and the resistance of the electrical heater.
Pemanas elektrik itu disambungkan kepada satu bekalan kuasa 240 V.
Hitung arus yang mengalir menerusi pemanas itu dan rintangan pemanas elektrik itu.

[4 marks / *markah*]

(iii) State the energy that occurs when the electrical heater is switched on. [1 mark / *markah*]
Nyatakan perubahan tenaga yang berlaku apabila pemanas elektrik itu dihidupkan.

……

(b) Table 26.1 shows the characteristics of five conductors, *P*, *Q*, *R*, *S* and *T* that can be used as the material of a connecting wire.
Jadual 26.1 menunjukkan crri-ciri bagi lima konduktor P, Q, R, S dan T yang boleh digunakan sebagai bahan bagi satu wayar konduktor.

Conductor *Konduktor*	Melting point / °C *Takat lebur / °C*	Density / kgm^{-3} *Ketumpatan / kgm^{-3}*	Level of oxidation *Kadar pengoksidaan*	Resistivity / Ω m *Kerintangan / Ω m*
P	457	2.6×10^{3}	Low / *Rendah*	1.4×10^{-6}
Q	349	3.2×10^{3}	High / *Tinggi*	2.3×10^{-7}
R	1435	1.9×10^{3}	Low / *Rendah*	4.2×10^{-7}
S	1520	4.7×10^{3}	High / *Tinggi*	5.6×10^{-6}
T	1452	2.0×10^{3}	Low / *Rendah*	1.2×10^{-7}

Table 26.1 / *Jadual 26.1*

As an engineer, you are assigned to study each characteristic of conductors, *P*, *Q*, *R*, *S* and *T*. Then, determine the most suitable material to be used for the connecting wire to transmit electricity through a long distance.
Sebagai seorang jurutera, anda ditugaskan untuk mengkaji ciri-ciri setiap konduktor P, Q, R, S dan T. kemudian, tentukan bahan yang paling sesuai digunakan untuk wayar konduktor bagi penghantaran elektrik melalui jarak yang panjang.

[10marks / *markah*]

QUESTION 26 CURRENT, VOLTAGE AND RESISTANCE COMPARISONS

26 **(a)** Diagram 26.1 shows three resistor of resistance R_1, R_2 and R_3 connected in a circuit.
Rajah 26.1 menunjukkan tiga perintang dengan rintangan R_1, R_2 dan R_3 yang disambungkan dalam satu litar.

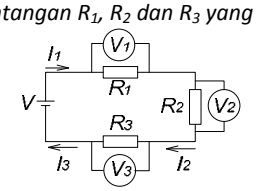


Diagram 26.1 / *Rajah 26.1*

(i) Name the type of connection of resistance as shown in Diagram 26.1. [1 mark / *markah*]
Namakan jenis sambungan perintang-perintang seperti yang ditunjukkan dalam Rajah 26.1.

.....

(ii) Fill in the blanks with correct sign to complete the sentences below. [3 marks / *markah*]
Isikan tempat kosong dengan tanda yang betul untuk melengkapkan ayat-ayat berikut.

The current through the battery / *Arus yang mengalir melalui bateri*, $I = I_1$.....I_2.....I_3

The total potential difference across battery / *Beza keupayaan merentasi bateri*, $V = V_1$.....V_2.....V_3

The effective resistance / *Jumlah rintangan berkesan*, $R = R_1$.....R_2.....R_3

(b) An electric kettle rated '240 V, 2 kW' is used to heat up 1 kg water from 25°C to 100°C. The specific heat capacity of water is 4200 J $kg^{-1}°C^{-1}$.
Sebuah cerek elektrik berkadar '240 V, 2 kW' digunakan untuk memanaskan 1 kg air daripada 25℃ ke 100℃. Muatan haba tentu bagi air ialah 4200 J kg^{-1} ℃$^{-1}$.

(i) Calculate the heat absorbed by the water / *Hitung tenaga yang diserap oleh air*. [2 marks / *markah*]

(ii) Calculate the time taken to boil the water / *Hitung masa yang diambil untuk mendidih air*. [2 marks / *markah*]

(iii) State the assumption you made in **26**(b)(i) / *Nyatakan andaian yang anda buat di **26**(b)(i)*. [1 mark / *markah*]

.....

(c) As an electrical engineer, you are assigned to modify an electrical circuit that can light up the lamps labeled '240 V, 1000 W' in office brightly. You design should be based on the following aspects:
Sebagai seorang jurutera elektrik, anda ditugaskan untuk mengubahsuai satu litar elektrik yang boleh menyalakan lampu-lampu berlabel '240 V, 1000 W' di office dengan terang. Pengubahsuaian anda hendaklah merangkumi aspek-aspek berikut:
-Connection of voltage supplier / *Sambungan pembekal voltan*
-Connection of lamps / *Sambungan lampu-lampu*
-Type of fuse to be used / *Jenis fius yang digunakan*
-Type of connecting wire / *Jenis dawai sambungan*
-Diameter of connecting wire / *Diameter dawai sambungan*
[10 marks / *markah*]

(d) You are given three identical voltage suppliers with each 12 V, three identical resistors with each 2 Ω and three identical bulbs with each labeled '6 V, 15 W' but with different arrangement circuits as shown in Diagram 26.2 and Diagram 26.3.
Anda diberi tiga pembekal voltan serupa dengan setiapnya 12 V, tiga perintang serupa dengan setiapnya 2Ω dan tiga mentol serupa dengan setiapnya berlabel '6 V, 15 W' tetapi dengan penyusunan litar yang berbeza seperti ditunjukkan dalam Rajah 26.2 dan Rajah 26.3.

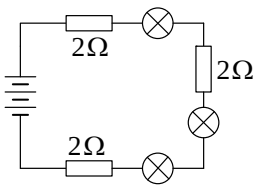


Diagram 26.2/ *Rajah 26.2*

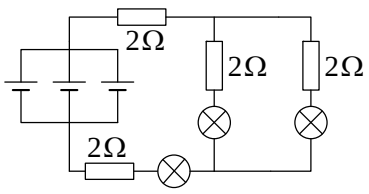


Diagram 26.3/ *Rajah 26.3*

Calculate the total voltage, total effective resistance and total power to be consumed by the bulbs for both Diagram 26.2 and Diagram 26.3.
Hitung jumlah voltan, jumlah rintangan berkesan dan jumlah kuasa digunakan oleh mentol-mentol untuk kedua-dua Diagram 26.2 dan Diagram 26.3.

QUESTION 27 FARADAY'S LAW AND LENZ'S LAW

27 Diagram 27.1, 27.2 and 27.3 show a bar magnet is being pushed towards, away from and stays stationary in a solenoid respectively.

Rajah 27.1, 27.2 dan 27.3 menunjukkan satu magnet bar dimasukkan ke dalam, dikeluarkan daripada dan kekal pegun di dalam satu solenoid masing-masing.

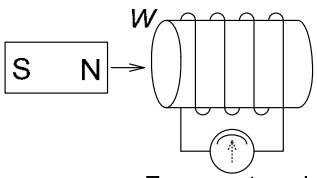


Diagram 27.1/ *Rajah 27.1*

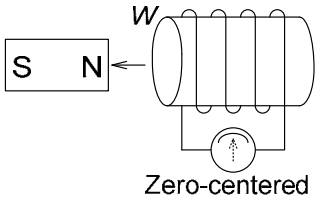


Diagram 27.2/ *Rajah 27.2*

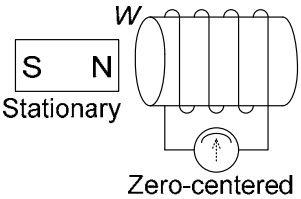


Diagram 27.3/ *Rajah 27.3*

(a) State a physics law involved for the direction of needle deflection of galvanometer as shown in diagrams. [1mark]
Nyatakan satu hukum fizik yang terlibat untuk arah pesongan jarum galvanometer seperti ditunjukkan dalam rajah-rajah.

.....

(b) Define the law you state in **27**(a). [1 mark / *markah*]
*Takrifkan hukum yang anda nyatakan di **27**(a).*

.....

.....

(c) By use of law you state in **27**(a), determine the magnetic pole at W for: [3 marks / *markah*]
*Dengan menggunakan hukum yang anda nyatakan di **27**(a), tentukan kekutuban magnet di W untuk:*

Diagram 27.1/ *Rajah 27.1*: .....

Diagram 27.2/ *Rajah 27.2*: .....

Diagram 27.3/ *Rajah 27.3*: .....

(d) What is the physical quantity being measured by galvanometer as shown in diagrams? [1 mark / markah]
Apakah kuantiti fizikal yang diukur oleh galvanometer seperti ditunjukkan dalam rajah-rajah?

.....

(e) In Diagram 27.1, the magnet bar is moving faster into the solenoid.
Dalam Rajah 27.1, bar magnet itu dimasukkan dengan lebih laju ke dalam solenoid.

(i) What will happen to the reading of the galvanometer? [1 mark / *markah*]
Apakah yang akan berlaku kepada bacaan-bacaan galvanometer?

.....

(ii) Give reason for your answer in **27**(e)(i). [1 mark / *markah*]
*Berikan sebab untuk jawapan anda di **27**(e)(i).*

.....

(iii) State the physics law you applied. [1 mark / *markah*]
Nyatakan hukum fizik yang anda aplikasikan.

.....

(f) State ways to increase the magnitude of deflection of galvanometer based on following aspects given and state the reason. [1 mark / *markah*]
Nyatakan cara-cara untuk menambahkan magnitud pesongan galvanometer berdasarkan pada aspek-aspek berikut dan berikan sebab.

-Strength of magnet / *Kekuatan magnet*
-Number of turns of coils / *Bilangan lilitan gegelung*
-Type of wire used to make the coils / *Jenis dawai digunakan untuk membuat gegelung*
-Diameter of wire / *Diameter dawai*
-Speed of magnet bar moving / *Kelajuan bar magnet bergerak*
[10 marks / *markah*]

QUESTION 28 CONCEPT OF ELECTROMAGNET

28 Diagram 28.1 and 28.2 show the insulated copper wires are wrapped around iron nail to form an electromagnet.
Rajah 28.1 dan Rajah 28.2 menunjukkan dawai kuprum bersalut yang digelung pada paku besi untuk membentuk satu elektromagnet.

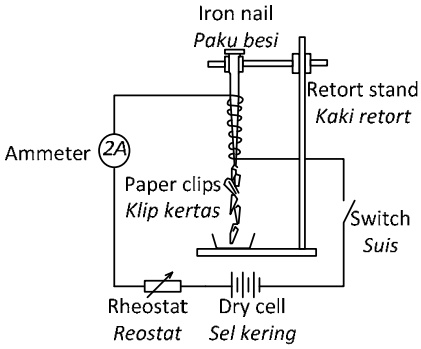


Diagram 28.1/ *Rajah 28.1*

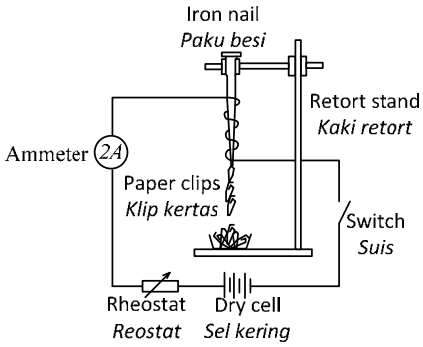


Diagram 28.2/ *Rajah 28.2*

When the switch is on and paper clips of the same amount are put in the plates, the paper clips are attracted to the nail.
Apabila suis dihidupkan dan klip kertas dengan amaun yang sam diletakkan di dalam petri, klip kertas akan ditarik kepada paku.

(a) What is meant by electromagnet?
Apakah yang dimaksudkan dengan elektromagnet?

……

(b) Using Diagram 28.1 and Diagram 28.2, compare the number of turns in solenoid, the amount of current flowing and the number of paper clips attracted to the solenoid. State the relationship between the number of turns in solenoid to the number of paper clips being attracted and hence, deduce the relationship between the number of turns of coil to the strength of the magnet being produced.
Menggunakan Rajah 28.1 dan Rajah 28.2, banding bilangan gegelung dalam solenoid, amaun arus mengalir dan bilangan klip kertas ditarik kepada solenoid. Nyatakan hubungan antara bilangan gegelung dalam solenoid dengan bilangan klip kertas yang ditarik dan kemudian, deduksikan hubungan antara bilangan gegelung dengan kekuatan magnet yang dihasilkan.

……

……

……

(c) Diagram 28.3 shows an electric bell connected to dry cells.
Rajah 28.3 menunjukkan satu loceng elektrik yang disambungkan kepada sel kering.

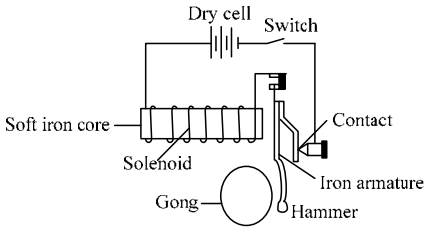


Diagram 28.3 / *Rajah 28.3*

Explain how the electric bell functions / *Terangkan bagaimana loceng elektrik berfungsi.*

……

……

……

(d) An electric bell in Diagram 28.3 is modified in order to produce a louder sound.
Table 28.1 shows the characteristics of electric bells *P*, *Q*, *R*, *S* and *T* which could produce a loud sound.
Loceng elektrik di dalam Rajah 28.3 diubahsuai untuk menghasilkan bunyi yang lebih kuat.
Jadual 28.1 menunjukkan ciri-ciri bagi loceng elektrik P, Q, R, S dan T yang boleh menghasilkan bunyi yang kuat.

Electric Bell *Loceng elektrik*	Size of hammer *Saiz hammer*	Distance hammer to gong/cm *Jarak hammer ke gong / cm*	Number of turns at core *Bilangan gelung pada teras*	Curvature of gong *Kelengkungan gong*
P	Big / *Besar*	2.0	50	Big / *Besar*
Q	Big / *Besar*	5.0	100	Big / *Besar*
R	Big / *Besar*	5.0	100	Small / *Kecil*
S	Small / *Kecil*	5.0	50	Small / *Kecil*
T	Small / *Kecil*	2.0	100	Small / *Kecil*

Table 28.1/ *Jadual 28.1*

Explain the suitability of each characteristic of the electric bell in Table 28.1 and hence, determine which electric bell is able to produce the loudest sound. Justify your choice. [10 marks / *markah*]
Terangkan kesesuaian setiap ciri loceng elektrik dalam Jadual 28.1 dan kemudian, tentukan loceng elektrik yang manakah boleh menghasilkan bunyi yang paling kuat. Justifikasi pilihan anda.

QUESTION 29 CONCEPT OF ELECTROMAGNETIC INDUCTION

29 Diagram 29.1 shows a bar magnet is hung on a spring that attached to a retort stand. The bar magnet is displaced downwards and released so it can oscillate through a solenoid which is connected to a centre-zero galvanometer.
Rajah 29.1 menunjukkan satu magnet bar digantung pada spring yang dihubungkan kepada satu kaki retort. Magnet bar itu disesarkan ke bawah dan dilepaskan supaya ia berayun melalui solenod yang disambungkan kepada galvanometer pusat sifar.

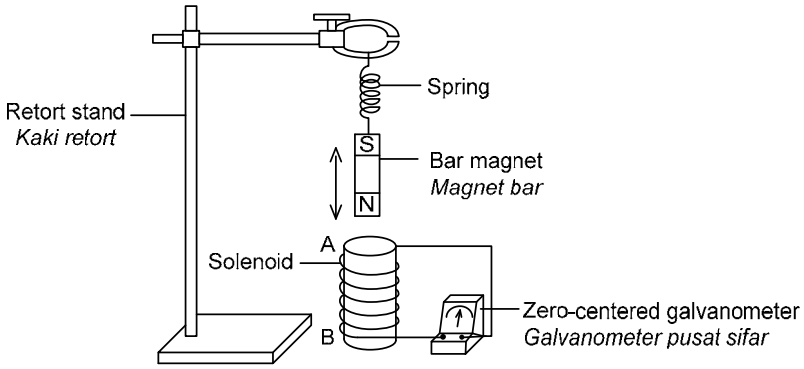


Diagram 29.1/ *Rajah 29.1*

(a) **(i)** Name the physical quantity being shown by the reading of galvanometer. [1 mark / *markah*]
Namakan kuantiti fizikal yang ditunjukkan oleh bacaan galvanometer.

……

(ii) State the physics concept for the produce of the reading of galvanometer. [1 mark / *markah*]
Nyatakan konsep fizik yang menghasilkan bacaan galvanometer.

……

(b) When the bar magnet move towards the solenoid, the galvanometer pointer deflect for a while.
Apabila magnet bar bergerak ke arah solenoid, penunjuk galvanometer memesong untuk seketika.

(i) Explain why the galvanometer pointer deflects? [1 mark / *markah*]
Terangkan mengapa penunjuk galvanometer memesong?

……

(ii) State the polarity of end *A* and end *B* of the solenoid. [2 marks / *markah*]
Nyatakan kekutuban pada hujung A dan hujung B bagi solenoid itu.

A: ……. *B*: …….

(iii) State the direction of the deflection of the galvanometer pointer. [1 mark / *markah*]
Nyatakan arah pesongan penunjuk galvanometer itu.

……

(c) Diagram 29.2 shows a moving coil ammeter
Rajah 29.2 menunjukkan satu ammeter gegelung bergerak.

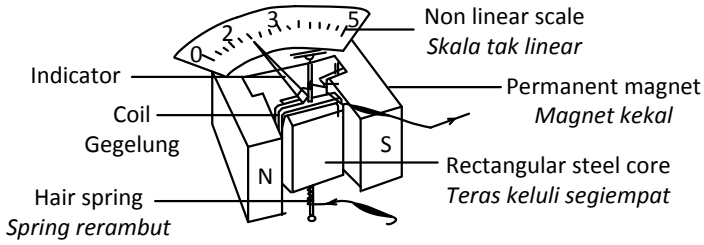


Diagram 29.2/ *Rajah 29.2*

Explain how you would design a moving coil ammeter that can function better. In your explanation, emphasize the following aspects:
Terangkan bagaimana anda akan merekabentuk satu ammeter gegelung bergerak yang boleh berfungsi dengan lebih baik. Dalam penerangan anda, tekankan aspek-aspek berikut:
-Hardness of hair spring / *Kekerasan spring rerambut*
-Shape of the permanent magnet / *Bentuk magnet kekal*
-Shape of the core / *Bentuk teras*
-Type of the core material / *Jenis bahan teras*
-Type of the ammeter scale */ Jenis skala ammeter*
[10 marks / *markah*]

QUESTION 30 TRANSISTOR AS CURRENT AMPLIFIER

30 Diagram 30.1 shows a circuit consisting of transistor, resistors, dry cells, an earphone and microphone.
Rajah 30.1 menunjukkan satu litar yang mengandungi transistor, perintang-perintang, sel-sel kering, fon telinga dan mikrofon.

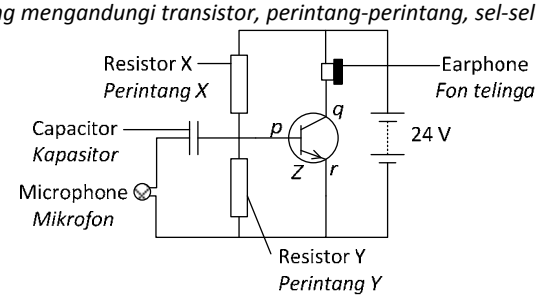


Diagram 30.1 / *Rajah 30.1*

(a) **(i)** What is the component labeled *Z* / *Apakah nama komponen berlabel Z*? [1 mark / *markah*]

.....

(ii) Label the name given to the terminals of *Z* for: [3 marks / *markah*]
Label nama diberi kepada terminal-terminal Z untuk:

p: ..... *q*: ..... *r*: .....

(iii) State the function of component Z in this circuit. [1 mark / *markah*]
Nyatakan fungsi bagi component Z dalam litar ini.

.....

(b) State the function for / *Nyatakan fungsi bagi*:
(i) Microphone / *Mikrofon*: .....
(ii) Capacitor / *Kapasitor*: .....
(iii) Resistor *X* and *Y* / *Perintang X dan Y*: .....
(iv) Earphone / *Fon telinga*: .....

(c) Explain the working principle of component *Z*. [4 marks / markah]
Terangkan fungsi kerja bagi komponen Z.

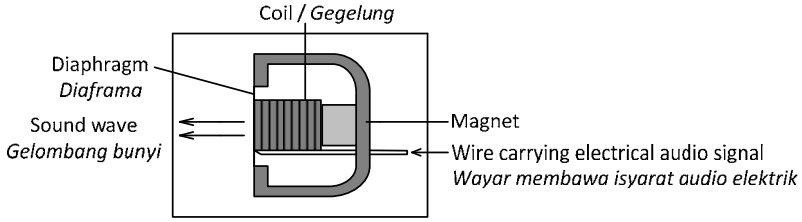
.....

.....

.....

(d) Given the resistance of resistor *X* and *Y* are 3 kΩ and 2 kΩ respectively. Calculate the voltage across resistor *X* and *Y* respectively. [4 marks / *markah*]
Diberi rintangan bagi perintang X dan Y ialah 3 kΩ dan 2 kΩ masing-masing. Hitung voltan merentasi perintang X dan Y masing-masing.

(e) Diagram 10.2 shows the cross section of a moving coil microphone.
Rajah 30.2 menunjukkan keratan rentas bagi satu mikrofon gegelung bergerak.



When the diaphragm moves in response to sound, the attached coil moves in the magnetic field and generates a very small current in the wire of the coil. Using an appropriate concept in physics, suggest and explain suitable modifications or ways to enable the microphone to detect sound effectively and generate bigger current based on the following aspect:
Apabila diframa bergerak balas dengan bunyi, gegelungnya bergerak ke dalam medan magnetik dan menjanakan satu arus yang kecil dalam wayar gegelung. Menggunakan konsep fizik yang sesuai, cadang dan terangkan pengubahsuaian atau cara yang sesuai untuk membolehkan mikrofon mengesan suara dengan berkesan dan menjanakan arus yang lebih besar berdasarkan pada aspek-aspek berikut:
(i) Thickness of diaphragm / *Ketebalan diaframa*
(ii) Strength of the material for diaphragm / *Kekuatan bahan diaframa*
(iii) Number of turns of coil / *Bilangan gegelung*
(iv) Diameter of the wire of coil / *Diameter wayar gegelung*
(v) Strength of magnet / *Kekuatan magnet*

QUESTION 31 APPLICATION OF MIRROR

31 *Diagram 31.1 shows two cars P and Q, travelling in the oppose directions, passing through a sharp band. A mirror is placed at X.*
Rajah 31.1 menunjukkan dua kereta P dan Q bergerak dalam arah berlawanan melalui satu selekoh tajam. Satu mirror diletakkan di X.

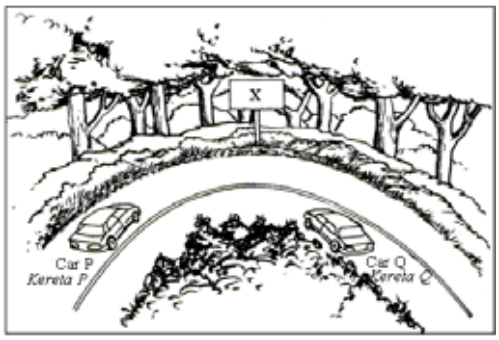
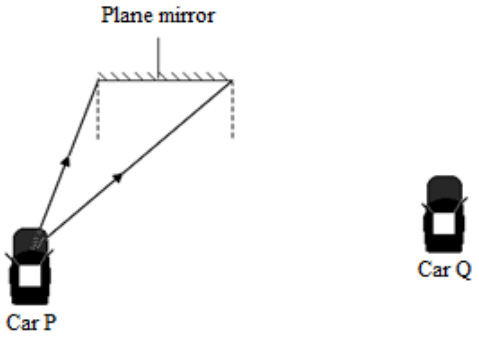


Diagram 31.1 / *Rajah 31.1*



Rajah 31.2 / *Rajah 31.2*

Diagram 31.2 shows an incomplete ray diagram when a plane mirror is placed at X.
Rajah 31.2 menunjukkan satu rajah sinar tidak lengkap apabila satu cermin satah diletakkan di X.

(a) **(i)** Complete the ray diagram in Diagram 31.2. [2 marks / *markah*]
Lengkapkan rajah sinar dalam Rajah 31.2.

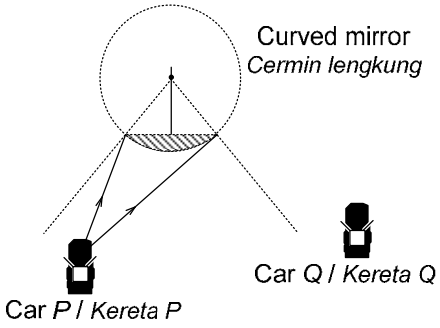
(ii) State the light phenomenon involved in **31**(a)(i). [1 mark / *markah*]
*Nyatakan fenomenon cahaya yang terlibat dalam **31**(a)(i).*

.....

(iii) Based on your answer in **31**(a)(i), state the problem experienced by the driver in car *P*. [1 mark / *markah*]
*Berdasarkan pada jawapan anda di **31**(a)(i), nyatakan satu masalah yang dihadapai oleh pemandu dalam kereta P.*

.....

(b) Diagram 31.3 shows an incomplete ray diagram when a curve mirror is placed at X to replace the plane mirror in Diagram 31.2. The curve mirror is used to overcome the problem that occurs in 31(a).
Rajah 31.3 menunjukkan satu rajah sinar tidak lengkap apabila satu cermin lengkung diletakkan di X untuk menggantikan cermin satah dalam Rajah 31.2. Cermin lengkung itu digunakan untuk mengatasi masalah yang berlaku dalam 31(a).



Rajah 31.3 / *Rajah 31.3*

(i) Give the name of the curve mirror. [1 mark / *markah*]
Beri nama bagi cermin lengkung itu.

.....

(ii) Complete the ray diagram in Diagram 31.3. [1 mark / *markah*]
Lengkapkan rajah sinar dalam Rajah 31.3.

.....

(iii) Based on your answer in **31**(b)(ii), explain how the curve mirror solved the problem in 31(a)(iii)?
*Berdasarkan jawapan anda di **31**(b)(ii), terangkan bagaimana cermin lengkung itu mengatasi masalah dalam 31(a)(iii)?*

.....

(c) The characteristics of the image formed by the curved mirror in Diagram 1.3 are diminished, virtual and upright.
Ciri-ciri bagi imej yang terbentuk oleh cermin lengkung itu dalam Rajah 31.3 adalah mengecil, maya dan tegak.

(i) What happen to the characteristics of the image when the focal length of the curved mirror is increased?
Apakah yang berlaku kepada ciri-ciri imej apabila panjang fokus bagi cermin lengkung itu ditambahkan?

.....

(ii) Give the reason for your answer in **31**(c)(i). [1 mark / *markah*]
*Beri sebab untuk jawapan anda di **31**(c)(i).*

.....

QUESTION 32 WAVE OF OSCILLATED SPRING

32 Diagram 32.1 shows a displacement-time graph of the oscillation of a loaded spring.
Rajah 32.1 menunjukkan satu graf sesaran-masa bagi suatu ayunan spring berbeban.

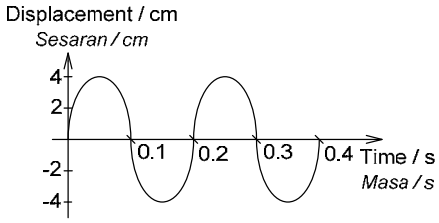


Diagram 32.1 / *Rajah 32.1*

(a) Based on the Diagram 32.1 / *Berdasarkan pada Rajah 32.1*:

(i) Label the period using the symbol *T*. [1 mark / *markah*]
Label tempoh dengan menggunakan simbol T.

(ii) Label the amplitude using the symbol *A*. [1 mark / *markah*]
Label amplitude dengan menggunakan simbol A.

(iii) What is meant by period / *Apakah maksud tempoh*? [1 mark / *markah*]

……

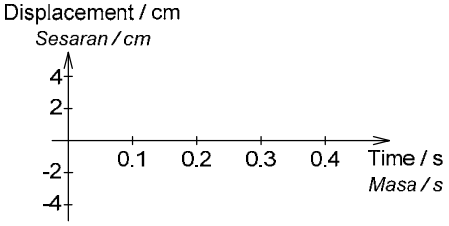
(b) What will happen to the period of the oscillation when the frequency of the waves increases? [1 mark / *markah*]
Apakah yang akan berlaku kepada tempoh ayunan apabila frekuensi gelombang ditambahkan?

……

(c) If the spring is undergoing damping, what will happen to the amplitude of the oscillation? [1 mark / *markah*]
Jika spring itu mengalami pelembapan, apakah yang akan berlaku kepada amplitud ayunan?

……

(d) Loaded spring will stop oscillating after a few minutes. On diagram below, sketch the displacement-time graph to show the damping process. [2 marks / *markah*]
Spring berbeban akan berhenti berayun selepas beberapa minit.Pada rajah berikut, lakarkan graf sesaran-masa untuk menunjukkan proses pelembapan itu.



(e) Diagram 32.2 shows an experiment to determine the wavelength of monochromatic light waves by using a red light source.
Rajah 32.2 menunjukkan satu eksperimen untuk menentukan panjang gelombang bagi suatu cahaya monokromatik dengan menggunakan sumber cahaya merah.

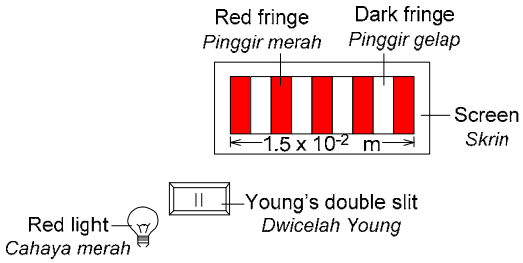


Diagram 32.2 / *Rajah 32.2*

(i) What is meant by monochromatic light / *Apakah maksud cahaya monokromatik*? [1 mark / *markah*]

……

(ii) Why are red fringes formed on the screen / *Mengapa pinggir-pinggir merah terbentuk pada skrin*? [1 mark]

……

(iii) The distance between the Young's double-slit and the screen is 3.0 m. The double slit used has the slit separation is 5 x 10^{-4} m. Calculate the wavelength of the red light. [2 marks / *markah*]
Jarak antara dwicelah Young dan skrin ialah 3.0 m. Dwicelah yang digunakan mempunyai jarak cerah 5 × 10^{-4} m. Hitung panjang gelombang bagi cahaya merah.

(iv) The red light is replaced by the green light. What happen to distance between two consecutive dark fringes. Give reason. [2 marks / *markah*]
Cahaya merah digantikan dengan cahaya hijau. Apakah yang akan berlaku kepada jarak antara dua pinggir gelap yang berturutan? Beri sebab.

QUESTION 33 SOUND WAVE

33 Diagram 33.1 shows three students investigating a phenomenon of sound wave by standing at position *L*, *M* and *N*. A signal generator and a speaker is set next to the corner of the building. The investigation is carried out by changing the frequency of the signal generator and the three students are assign to listen to the sound transmited by the speaker begin with a frequency of 586 Hz.

Rajah 33.1 menunjukkan tiga pelajar menyisat fenomenon gelombang bunyi dengan berdiri di posisi L, M dan N. Satu penjana isyarat dan satu pembesar suara diletakkan bersebelahan dengan sudut bangunan itu. Penyiasatan dijalankan dengan mengubah frekuensi penjana isyarat dan tiga pelajar ditugaskan untuk mendengar bunyi yang dikeluarkan oleh pembesar suara bermula dengan frekuensi 586 Hz.

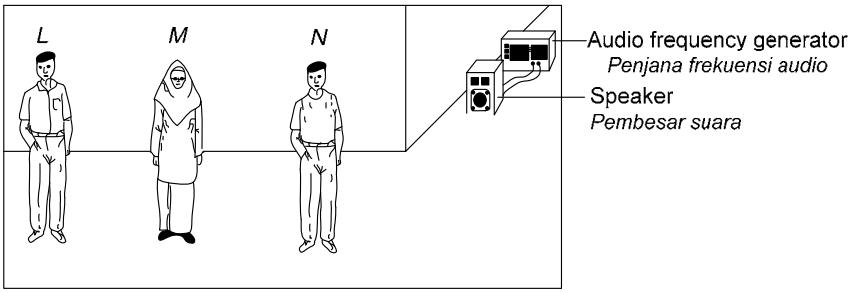


Diagram 33.1 / *Rajah 33.1*

(a) **(i)** What type of wave is the sound wave? [1 mark / *markah*]
Apakah jenis gelombang bagi gelombang bunyi?

.....

(ii) As the frequency of the signal generator increases only one student can still hear the sound clearly. Which of the student is able to hear the sound clearly? [1 mark / *markah*]
Apabila frekuensi bagi penjana isyarat bertambah, seorang pelajar saja dapat mendengar bunyi itu dengan jelas. Pelajar yang manakah boleh mendengar suara itu dengan jelas?

.....

(iii) Give one reason for your answer in **33**(e)(ii). [1 mark / *markah*]
*Beri satu sebab untuk jawapan anda di **33**(e)(ii).*

.....

(b) The speed of the sound wave in air is 330 ms^{-1}. Calculate the wavelength of the sound wave. [2 marks / *markah*]
Laju gelombang bunyi di dalam udara ialah 330 ms^{-1}. Hitung panjang gelombang bagi gelombang bunyi itu.

(c) On the space below, sketch a graph to present a change of sound wave from high pitch sound to low pitch sound with constant loudness. [2 marks / *markah*]
Pada ruangan bawah, lakarkan satu graf untuk menggambarkan perubahan gelombang bunyi dari kelanggsingan tinggi kepada kelangsingan rendah dengan kekuatan bunyi dimalarkan.

(d) On the space below, sketch a graph to present a change of sound wave from high loudness to low loudness of sound with constant pitch of sound. [2 marks / *markah*]
Pada ruangan bawah, lakarkan satu graf untuk menggambarkan perubahan gelombang bunyi dari bunyi tinggi kepada bunyi rendah dengan kelangsingan bunyi dimalarkan.

QUESTION 34 MOMENTUM, IMPULSE AND IMPULSIVE FORCE

34 Diagram 34.1 shows a softball moving with high momentum.
Rajah 34.1 menunjukkan satu bola lisut yang bergerak dengan momentum yang tinggi.

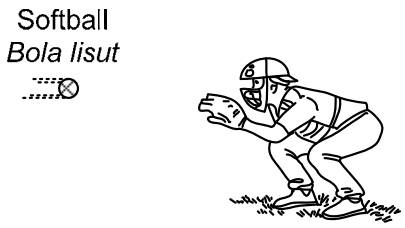


Diagram 34.1 / *Rajah 34.1*

(a) What is meant by momentum? [1 mark / *markah*]
Apakah yang dimaksudkan dengan momentum?

……

(b) Calculate the momentum of the softball if the mass of the ball is 80 g and its velocity is 100 ms^{-1}. [1 mark/ *markah*]
Hitung momentum bagi bola lisut itu jika jisim bolanya ialah 80 g dan halajunya ialah 100 ms^{-1}.

(c) If the mass of the ball is increased but its momentum remains unchanged. How does its velocity changes? [1 mark]
Jika jisim bola ditambahkan tetapi momentumnya tidak berubah. Bagaimanakah halajunya berubah?[1 markah]

……

(d) Using the concept of force, explain why the player needs to wear a glove to catch a fast moving softball? [2 marks]
Menggunakan konsep daya, terangkan mengapa pemain perlu memakai sarung tangan untuk menangkap bola lisut yang bergerak dengan laju? [2marks / markah]

……

……

(e) Diagram 34.2 shows a baseball player wearing a soft thick glove to catch a ball during a baseball match.
Rajah 34.2 menunjukkan seorang pemain bola lisut memakai sarung tangan tebal yang lembut untuk menangkap bola semasa pertandingan bola lisut.

Diagram 34.2 / *Rajah 34.2*

(i) What is meant by impulsive force? [1 mark/ *markah*]
Apakah maksud daya impuls?

……

(ii) The ball of mass 0.15 kg moves with a velocity of 20 m s^{-1}.
Calculate the impulsive force acting on the glove when the time of impact is 8.0 x 10^{-2} s. [1 mark/ *markah*]
Bola berjisim 0.15 kg bergerak dengan kelajuan 20 ms^{-1} apabila dipukul.
Hitungkan daya impuls yang bertindak ke atas sarung tangan jika masa tindak balas 8.0 x 10^{-2} s.

(iii) Compare the impulsive force if the baseball player wears a hard glove to catch the ball. Explain your answer. [2 markS/ *markah*]
Bandingkan daya impuls yang dihasilkan jika pemain itu menggunakan sarung tangan yang keras untuk menangkap bola. Jelaskan jawapan anda.

……

……

(iv) Define the impulse. [1 mark / *markah*]
Takrifkan impuls.

……

QUESTION 35 APPLICATION OF TRANSFORMER

35 Diagram 35.1 shows an electrical transmission system from the power station to the consumers.
Rajah 35.1 menunjukkan sistem penghantaran elektrik dari stesen janakuasa kepada pengguna.

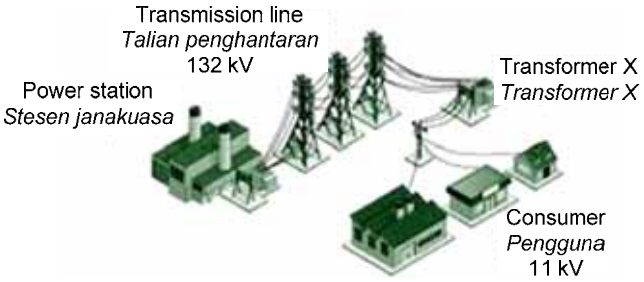


Diagram 35.1 / *Rajah 35.1*

(a) What is the function of a transformer / *Apakah kegunaan tranformer*? [1 mark / *markah*]

……

(b) Table 35.1 shows the information of the components in an electrical transmission system.
Jadual 35.1 *menunjukkan maklumat tentang komponen suatu sistem penghantaran elektrik.*

Electrical transmission system model ***Model system penghantaran elektrik***	***P***	***Q***	***R***
Number of turns of the primary coil ***Bilangan lilitan gegelung primer***	100	3600	1200
Number of turns of the secondary coil ***Bilangan lilitan gegelung sekunder***	1200	1200	100
Type of transformer core ***Jenis teras transformer***	Laminated soft iron *Besi lembut berlamina*	Soft iron *Besi lembut*	Laminated soft iron *Besi lembut berlamina*
Materials of transmission wire ***Bahan bagi kabel penghantaran***	Constantant *Konstantan*	Aluminium *Aluminium*	Aluminium *Aluminium*

Table 35.1 / Jadual 35.1

Based on Table 35.1, state the suitable characteristics for electric transmission system as shown in Diagram 35.1.
Berdasarkan pada Jadual 35.1, nyatakan ciri-ciri yang sesuai bagi sistem penghantaran elektrik seperti dalam Rajah 35.1.

(i) Number of turns of primary and secondary coil for Transformer *X*. [2 marks / *markah*]
Bilangan lilitan bagi gegelung primer dan sekunder Transformer X.

……

Reason / *Sebab.*

……

(ii) Type of core of the transformer / *Jenis teras transformer*. [2 marks / *markah*]

……

Reason / *Sebab.*

……

(iii) Material of transmission wire / *Bahan bagi kabel penghantaran*. [2 marks / *markah*]

……

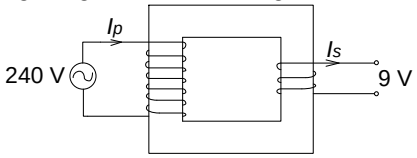
Reason / *Sebab.*

……

(iv) Based on your answers in **35**(*b*)(i),(*b*)(ii) and (*b*)(iii), determine the most electric transmission model. [1mark]
Berdasarkan jawapan anda dalam ***35***(*b*)(i), (*b*)(ii) *dan* (*b*)(iii), *tentukan model penghantaran elektrik yang paling sesuai*.

……

(c) Diagram shows a transformer which changes the mains supply from 240 V to 9 V.
Rajah menunjukkan sebuah transformer yang mengubah bekalan tenaga elektrik 240 V *kepada* 9 V.



The electric current in the primary coil, I_p and the secondary coil, I_s, is 0.1 A and 2.0 A respectively.
Arus elekrik yang mengalir dalam gegelung primer, I_p *dan gegelung sekunder,* I_s *masing-masing adalah 0.1 A dan 2.0 A.*

(i) Calculate the efficiency of the transformer. [2 marks / *markah*]
Kirakan kecekapan transformer tersebut.

(ii) What is the power loss in the transformer? [2 marks / *markah*]
Berapakah kehilangan kuasa transformer tersebut?

QUESTION 36 PRESSURE IN LIQUID

36 Diagram 36.1 shows a public water tank which supplies water for domestic use to a residential area.
Rajah 36.1 menunjukkan sebuah tangki air awam yang membekalkan air untuk kegunaan domestik di satu kawasan perumahan.

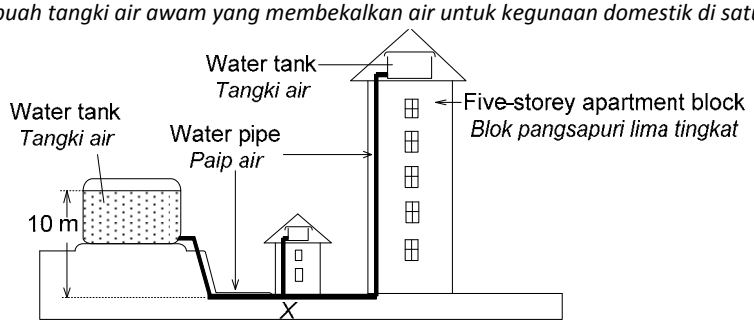


Diagram 36.1 / *Rajah 36.1*

(a) Define the meaning of pressure. [1 mark / *markah*]
Takrifkan maksud tekanan.

……

(b) State **one** factor which affects pressure in a liquid. [1 mark / *markah*]
*Nyatakan **satu** faktor yang mempengaruhi tekanan dalam cecair.*

……

(c) Based on Diagram 36.1, calculate the water pressure at **X.** [Density of water = 10^3 kgm^{-3}]. [2 marks / *markah*]
*Berdasarkan Rajah 36.1, hitungkan tekanan air di **X.** [Ketumpatan air =10^3 kgm^{-3}].*

(d) Tenants on the fifth floor of the apartment block are unable to obtain tap water. Why? [1 mark / *markah*]
Penghuni di tingkat lima blok pangsapuri tidak menerima bekalan air paip. Mengapa?

……

(e) The public water supply system cannot sastify all the tenant needs in fifth floor of the apartment block. Suggest and explain modifications to the water distribution system shown in Diagram 36.1 to ensure the following:
Tangki air itu tidak dapat memenuhi keperluan semua penghuni di blok pangsapuri lima tingkat. Cadang dan terangkan pengubahsuaian yang perlu dilakukan kepada sistem taburan air seperti dalam Rajah 36.1 untuk setiap yang berikut:

(i) Sufficient water supply for all area residents. [1 mark / *markah*]
Bekalan air yang mencukupi untuk semua penghuni kawasan.

……

(ii) Water supply reaches the fifth floor of the apartment building. [1 mark / *markah*]
Bekalan air boleh sampai ke tingkat lima blok pangsapuri.

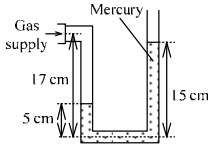
……

(f) The public water supply system often faces a problem in delivering water to water tanks located on tall buildings. Suggest and explain **one** other way to overcome this problem. [2 marks / *markah*]
*Sistem bekalan air awam kerapkali menghadapi masalah untuk menyalurkan air ke tangki air yang berada di bahagian atas bangunan tinggi. Cadangkan dan jelaskan **satu** cara lain untuk mengatasi masalah ini.*

……

……

(g) Diagram 36.2 shows the mercury levels in a mercury manometer used to measure the pressure of a gas supply.
Rajah 36.2 menunjukkan aras merkuri dalam satu manometer merkuri yang digunakan untuk mengukur tekanan bekalan gas.



The atmospheric pressure is 76 cmHg. What is the pressure of the gas supply? [2 marks / *markah*]
Tekanan atmosfera ialah 76 cmHg. Berapakah tekanan bekalan gas itu?

QUESTION 37 CONCEPT OF DENSITY AND ARCHIMEDES' PRINCIPLE

37 Diagram 37.1 shows a freely floating hydrometer in water.
Rajah 37.1 *menunjukkan hidrometer yang terapung pegun di dalam air.*

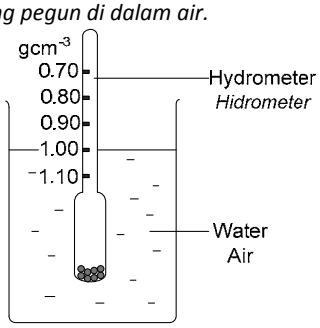


Diagram 37.1 / *Rajah 37.1*

A principle states that / *Satu prinsip menyatakan bahawa*;
When a body is immersed wholly or partially in a fluid, the buoyant force acting on the body is equal to the weight of the fluid it displaces.
Bila suatu objek yang direndamkan sepenuh atau sebahagiannya di dalam bendalir, daya tujah yang bertindak ke atas objek itu adalah sama dengan berat bendalir yang tersesar.

(a) **(i)** Name the principle above / *Namakan prinsip di atas*. [1 mark / *markah*]

.....

(ii) Mark on Diagram 37.1 the direction of the two forces acting on the hydrometer. [2 marks / *markah*]
Tandakan dengan anak panah arah daya-daya yang bertindak ke atas hidrometer pada Rajah 37.1.

(b) The hydrometer is removed from water, dried and then placed in oil.
Hidrometer itu dikeluarkan dari air, dikeringkan dan dimasukkan ke dalam minyak.

(i) Predict the length of the hydrometer that is submerged in oil, compared to the length in water. [1 mark]
Ramalkan panjang hidrometer yang tenggelam di dalam minyak, berbanding panjang di dalam air. [1 mark]

.....

(ii) Give **a** reason for your answer in **37**(*b*)(i). [1 mark / *markah*]
Nyatakan ***satu*** *alasan untuk jawapan anda dalam* **37**(*b*)(i).

.....

(c)

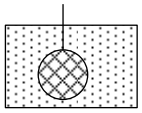


Diagram 37.2 / *Rajah* 37.2

Diagram 37.2 shows an object which has a weight of 0.25 N fully immersed in water. Its apparent weight is 0.22 N. [Density of water = 1000 kg m^{-3}]
Rajah 37.2 *menunjukkan satu objek yang mempunyai berat 0.25 N terendam sepenuhnya di dalam air.Berat ketara bahan itu ialah 0.22 N. [Ketumpatan air = 1000 kg* m^{-3}*]*

(i) What is the buoyant force on the object? [2 marks / *markah*]
Berapakah daya apungan yang bertindak ke atas objek?

(ii) Determine the volume of the object / *Tentukan isipadu objek itu*. [2 marks / *markah*]

(d) Diagram 37.3 shows a wooden sampan of mass 200 kg with a volume of 2 m^3 floating at sea.
Rajah 37.3 menunjukkan sebuah sampan kayu berjisim 200 kg dengan isipadu 2 m^3 *terapung di laut.*

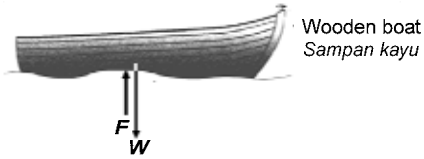


Diagram 37.3 / *Rajah 37.3*

(i) Name the force ***F*** and ***W*** shown in Diagram 37.3 [2 marks / *markah*]
Namakan daya ***F*** *dan* ***W*** *yang ditunjukkan dalam Rajah 37.3.*

.....

(ii) What is the relationship between ***F*** and ***W***? [1 mark / *markah*]
Apakah hubungan antara ***F*** *dan* ***W****?*

.....

(iii) Determine the magnitude of ***F*** / *Tentukan magnitud* ***F***. [2 marks / *markah*]

ANSWER OF PAPER 2 PREDICT

PHYSICS 2013

SMK MERBAU MIRI SARAWAK

QUESTION 1 TRANSFORMER

1 (a) (i) Is a transformer with output power which is same with input power

(ii) Step down transformer

(iii) So that the voltage can be alternated and induced to secondary coils according to the number of turns of transformer used

(b) Electromagnetic induction

(c) 1st: The a.c voltage is applied to the primary coil

2nd: An alternating current flow in primary coil will produce a magnetic flux around the coil

3rd: The magnetic flux will be induced to the secondary coil.

4tH: A magnetic flux in secondary coil will induce an alternating current

5th: Amount of induced current in secondary coil depends on the number or turns of secondary coil.

(d) To change the ac voltage to d.c voltage

(e) By ratio: 240 V → 1200 turns

? V → 800 turns

So, secondary voltage = 160 V

(f) (i) Input power, P = IV = 0.25 x 240 = 60 W

(ii) Transformer X: Output power = 12 W + 12 W + 12 W = 36 W

Transformer Y: Output power = 24 W + 12 W + 12 W = 48 W

Transformer Z: Output power = 18 W + 18 W + 18 W = 54 W

(iii) Transformer Z

(iv) Has higher output power meaning that higher efficiency

(g) (i) Same with inout power which is 60 W

(ii) Current dissipated as heat

(iii) Use soft magnet in transformer//use laminated magnet//use stronger magnet//use thicker wire to make coils

(h)

Characteristics	Reason
Use U-shape core	Centralize the magnet
Use soft iron core	Can be magnetized or demagnetized easily
Use laminated core	To reduce the eddy current
Use thicker wire	Thicker wire has smaller resistance

So, core D is chosen because it is in U-shape, the core is soft and laminated and the wire used is thick.

(i)

Characteristics	Reason
Use thicker diaphragm	Can withstand the pressure from stronger sound vibrations
Use high strength to make diaphragm	Long lasting
Use more turns	more magnetic flux cut
Use bigger diameter of the wire coil	Reduce resistance
Use higher strength of magnet	Produce stronger magnetic flux

QUESTION 2 CONCEPT OF SPRING

2 (a) States that the extension of spring is directly proportional to the mass of load being hung on it such that the elastic limit is not exceeded.

(b) Is the force per unit length of extension

(c) (i) The line of the graph is of straight line

(ii) stretched / d*iregangkan* : attractive force

compressed / *dimampatkan* : repulsive force

(d) From F = kx and F = mg

So, 0.4 x 10 = k x 0.20

k = 20 Nm^{-1}

(e) Use bigger diameter of spring//bigger diameter of coil of spring//use longer spring

(f) Is the ability of an object to resume to its original once the applied force is removed

(g) 1st: The spring has intermolecular force which is attractive or repulsive force

2nd: When the spring is stretched, the attractive force between molecules is more than repulsive force and thus pull the spring to its original state

3rd: When the spring is compressed, the repulsive force between molecules is more than attractive force and thus repel the spring to its original state

(h) (i) Elastic potential energy

(ii) From F = kx

3.6 = k[(12-8)/100]

k = 90 N m^{-1}

2 **(iii)** Energy stored, $E = \frac{1}{2} Fx \quad @ \frac{1}{2} kx^2$

$= \frac{1}{2} (3.6)(0.08)$ J

$= 0.144$ J

(iv) By ratio: 3.6 N → 4 cm

5 N → ? cm

So, ? = 5.55 cm

Hence, x = 12 cm – 5.55 cm

= 6.45 cm

(i) Note: to measure the small quantity of food in accurately.

Characteristics	Reason
Use smaller spring constant	The spring will be softer
One spring in series	More sensitive to applied force
Use longer spring	Can measure more force as more compression of spring
Low rusting rate	Can use for longer time without rust

So, weighing scale R is chosen because it has smallert spring constant, use one spring, the length of spring is long and has low rusting rate.

(j) Note: To make the baby's cradle

Characteristics	Reason
Use higher force constant	The spring will be stiffer and thus can support heavier load
Diameter of wire must be big	The spring will be stiffer
Diameter of coils of spring must be big	Less extension to heavier load
Use steel to make the spring	Strong material with low rusting rate

So, the spring S is chosen because it has big force constant, big diameter of wire to make spring, has big diameter of coils of wire to make spring and use steel material to make spring

(k) **(i)** Directly proportional

(ii) Hooke's law

(iii) Spring constant//Force constant

(iv) Spring B. Because spring B has more extension in length with smaller force

QUESTION 3 SEMICONDUCTOR DIODE

3 **(a)** Is an element which has its electricity conductivity between metal and non-metal

(b) Compare the type of semiconductor formed: Diagram 3.1 is p-type semiconductor but n-type semiconductor for Diagram 3.2

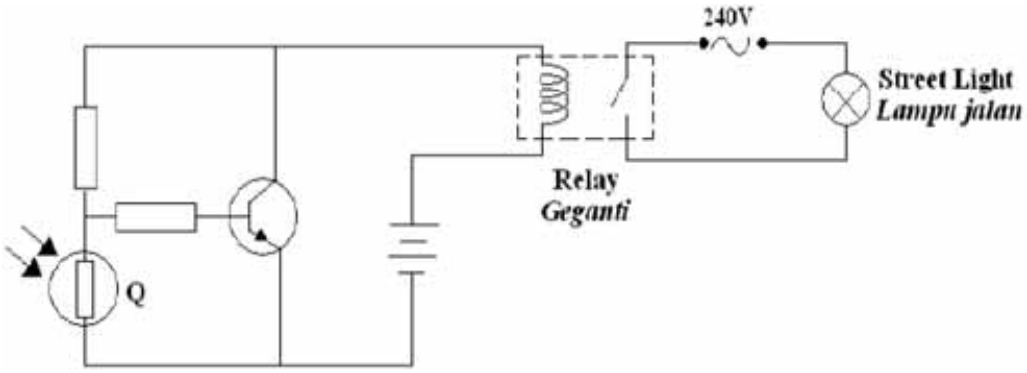
Function: Diagram 3.1: hole as positive majority charge carrier but Diagram 3.2: negative majority charge carrier

Valency of impurity: Diagram 3.1 is 3 but diagram 3.2 is 5

(c) Function: To allow the flow of current in one direction

Why: Connection is forward bias meaning the current flow in the direction of diode

(d)



Aspect	Reason
Use high a.c voltage on secondary circuit	Support lamps labeled "240 V, 120 W"
Use light dependent resistor	Sensitive to the intensity of light
Use n-p-n transistor	The transistor is forward bias with battery
Use relay switch	Just use small current to automatically turn on the bulb

(e)

Characteristics	Reason
Use more turns of coils	More cut of magnetic flux
Use high strength of magnet	Produce more magnetic flux
Use 4 diodes	Produce full wave rectification
Capacitance of capacitor must be big	To smoothen the output voltage faster

So, the generator Y is chosen as it has more turns of coils with high strength of magnet. The rectification circuit C is chosen as it uses 4 diodes with big value of capacitance of capacitor.

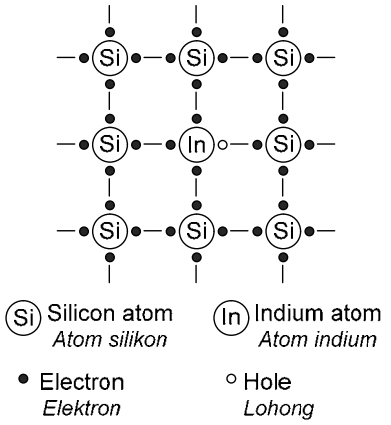
QUESTION 4 SEMICONDUCTOR DIODE

4 (a) Is an element which has its electricity conductivity between metal and non-metal

(b) Silicon, germanium

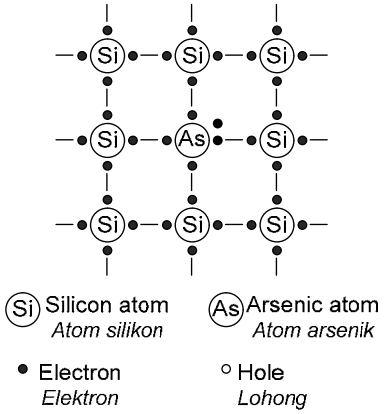
(c) (i) Is the process of adding impurities into the pure semiconductor

(ii)



-Use trivalent element such as indium
-Doped into the silicon
-There is missing one electron to be shared with neighbouring silicon.
-The missing one electron is called the hole
-The hole is the majority charge carrier for p-type semiconductor

(iii)



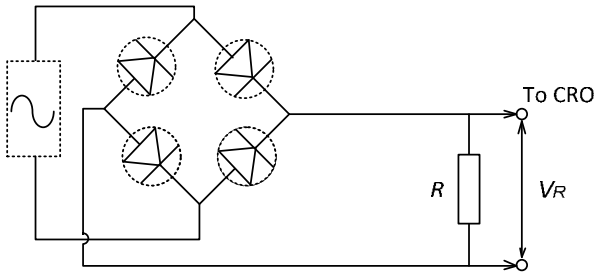
-Use pentavalent element such as arsenic
-Doped into the silicon
-There is extra one electron to be shared with neighbouring silicon.
-The extra one electron is called the electron
-The electron is the majority charge carrier for p-type semiconductor

(d) (i) Diagram 4.1 / *Rajah 4.1*: Forward bias
Diagram 4.2 / *Rajah 4.2*: Reversed bias

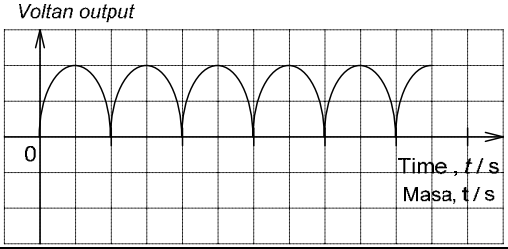
(ii) Bulbs in Diagam 4.1 light up but not for Diagram 4.2

(iii) To allow the flow of current in one direction

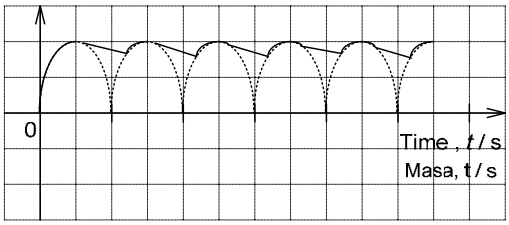
4 (e)



(f) Output voltage
Voltan output



(g) Output voltage
Voltan output



(h) To smoothen the output voltage

(i) **(i)** Step-down transformer

(ii) 240 V → N_P
12 V → 150
By ratio, N_P = 3000 turns

(iii) Input power, P = IV = 0.125 x 240 = 30 W
Output power = 24 W
Efficiency = (Output power/Input power) x 100%
= (24/30) x 100%
= 80%

(iv) So that the voltage can be alternated and induced to secondary coils according to the number of turns of transformer used

QUESTION 5 RADIOACTIVITY

5 **(a)** Is the unstable element which has same proton number but different nucleon number

(b) Location D. because rapid increase in the reading of ratemeter

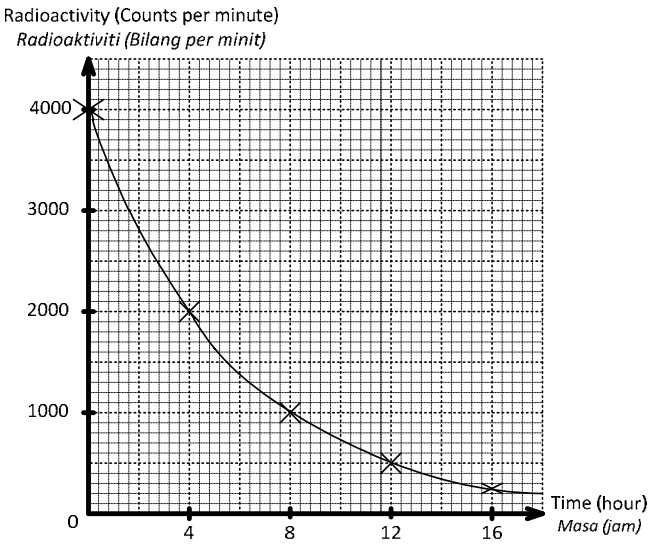
(c) **(i)** Radioactivity is the random and spontaneous disintegration of unstable nuclei to become more stable nuclei by releasing radiations and huge energy
Half-life is the time taken for half of the substance to disintegrate

(ii) Alpha is the helium particle
Beta is the fast moving electron
Gamma is an energetic electromagnetic ray

(iii) Means there is no way to tell which substance will undergo the decay process and no way to tell when it will decay

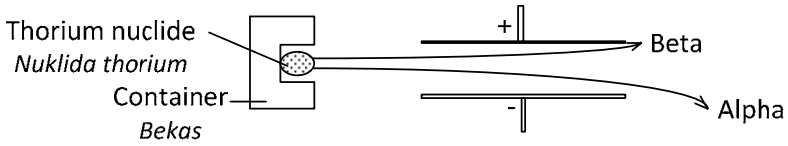
(iv) Spontaneous means the process happen automatically without triggered by any external source like temperature or pressure.

(c) **(v)**



(vi) Half-life = 4 hours

(d) **(i)**



(ii) Alpha is positive charge and deflected to negative plate
Beta is negative electron and deflected to positive plate

(iii) $^{234}_{90}Th \rightarrow {}^{226}_{88}Ra + 2\ {}^{4}_{2}He + 2\ {}^{0}_{-1}e$ + Energy
So, 2 alphas and 2betas

(iv) 48 g → 24 g →12 g →6 g
20 20 20
So, mass undecayed = 6 g

QUESTION 6 RADIOACTIVITY

6 (a) (i) Half-life is the time taken for half of the substance to disintegrate

(ii) Half-life for X = 10 minutes and Half-life for Y = 5 minutes
X: 400 counts per min, Y: 200 counts per min

(iii) Decay rate for substance Y is higher than X. Inversely proportional//Smaller half-lfe, faster rate of decay

(iv) There is a reading due to the background radiations

(b) Note: As a radiotherapy treatment for a brain tumor

Characteristics	Reason
Use short half-life	Decay faster and give less long term effect
Low ionizing power	Does not ionize the substantial cells
High penetrating power	Straight kill the tumor cells
Use gamma radiation	Has high penetrating power but low ionizing power
In liquid state	Easy to be put into the area of tumor cells by injection only

So, radioisotope P is chosen because it has short half-life, low ionizing power, high penetrating power, emits gamma and in liquid state.

QUESTION 7 RADIOACTIVITY

7 (a) (i) Is the process of splitting the heavy unstable nuclei to lighter more stable nuclei accompanied by release of radiations and energy

(ii) Is the process of combining two or more than two light nuclei to form heavier nuclei accompanied by release of radiations and energy

(ii) Nuclear fission involved in the splitting the nucleus but nuclear fusion involved in the combining the nucleus
Both decrease in mass which is called the mass defect
Both release energy

(b) Note: to ensure the volume of guava juice is uniform.

Characteristics	Reason
Use long half-life	The radioisotope can be used for longer time with the least of refillment cost
Emit beta	Has medium ionizing and penetrating power
In solid state	Easy to handle or carry without split
Has low ionizing power	Does not change the taste of the juice inside

So, radioisotope T is chosen because it has long half-life, use beta, in solid state and has low ionizing power

QUESTION 8 WAVES

8 (a) (i) Interference

(ii) So that the wavelength of the wave is constant at anywhere

(iii) Compare the distance between two sources: Diagram 8.1 < Diagram 8.2
Wavelength of the propagating water waves: Both diagrams have same wavelength as constant depth
Wave patterns produced by the spherical dippers: Both diagrams have same wave pattern
Distance between two adjacent antinodes: Diagram 8.1 < Diagram 8.2
Distance of two coherent sources is inversely proportional to the distance of two consecutive antinodes lines

(b) (i) Technique use the reflection of sound to detect depth or image

(ii) Has stronger energy//higher frequency

(iii) 1st: Use sound transmitter with known frequency
2nd: The sound is transmitted to the sea and the time to detect the echo is detected using microphone which is connected to CRO with the time-base is set.
3rd: The depth or sea, d = speed of sound x (echo /2)

(iv)

Suggested aspect	Reason
Distance between two speaker must be far	Produce nearer constructive sounds
The wall and floor must be curtained soft	To assorbe the echo
Power of speakers must be high	Produce louder sound
Speaker at all corners of building	Produce stereo sound
Microphones is placed far from speaker	Reduce sound disturbance

QUESTION 9 WAVES

9 (a) Transverse wave

(b) (i) Diffraction

(ii) Frequency / *Frekuensi* : no change
Wavelength / *Panjang gelombang* : no change
Speed of wave / *Laju gelombang* : no change

(c) Diagram 9.1. because the size of gap is smaller than the wavelength of the wave. The diffraction effect becomes obvious (change in shape can be seen clearly)

(d) Diagram 9.2. because the energy is not blocked by the big gap

9 **(e)** **(i)** Refraction

(ii) Frequency / *Frekuensi* : no change
Wavelength / *Panjang gelombang* : decrease
Speed of wave / *Laju gelombang* : decrease

(iii) *Refrer to teacher*

QUESTION 10 WAVES

10 **(a)** One wavelength//one colour of light

(b) Source of same frequency //same phase

(c) Light wave is a (longitudinal , transverse) wave.

(d) Diffraction , interference

(e) From $\lambda = ax/D$

Wavelength of the red light, $\lambda = (0.5 \times 10^{-3})(14 \times 10^{-3})/5$ as x = 42mm/3 = 14 mm
$= 1.4 \times 10^{-6}$ m

Wavelength of the blue light, $\lambda = (0.5 \times 10^{-3})(10.5 \times 10^{-3})/5$ as x = 42mm/4 = 10.5 mm
$= 1.05 \times 10^{-6}$ m

(f) **(i)** Mirage

(ii) Total internal reflection

(iii) Direction of the refracted rays will be refracted away from the normal line

(iv) Distance between two adjacent crest or two adjacent trough

QUESTION 11 WAVES

11 Note: to scan the image of foetus **safely**.

Characteristics	Reason
Use mechanical wave	The ultrasound needs medium to travel
Use high frequency of sound	Image formed can be seen clearly
Use low penetrating power	Does not hurt the feotus
Use low ionizing power	Does not change the structure of cells of feotus

So, the scanner X is chosen because it uses mechanical wave, has high frequency, has low penetrating power and also low ionizing power.

(f) **(i)** Electromagnetic spectrum

(ii) Amplitude: no change
Wavelength: decrease
Frequency: increase
Frequency of the wave is directly proportional to the energy of the wave
The wavelength of the wave is inversely proportional to the energy of wave

(iii) Name the waves of *P*, *Q*, *R*, *S*, *T* and *U*. [7 marks / *markah*]
Namakan gelombang-gelombang bagi P, Q, R, S, T and U.

P: radiowave, Q: microwave, R:infrared, S:visible light, T:ultraviolet ray, U:X-ray, V:gamma ray

(iv) P: broadcasting
Q: satellite//micro oven heating

QUESTION 12 GAS LAWS

12 **(a)** **(i)** Boyle's law states that for a fixed mass of gas, the pressure of gas is inversely proportional to the volume of gas such that its temperature is kept constant.

(ii) Charles' law states that for a fixed mass of gas, the volume of gas is directly proportional to the absolute temperature of gas such that its pressure is kept constant.

(iii) Pressure law states that for a fixed mass of gas, the pressure of gas is directly proportional to the absolute temperature of gas such that its volume is kept constant.

(b) **(i)** Bourdon gauge

(ii) Pressure of gas

(iii) The reading of X increases

(iv) Inversely proportional

(c) **(i)** Atmospheric pressure

(ii) Volume of trapped: Diagram 12.2> Diagram 12.3
Mass of gas trapped: Both diagram same
Pressure of trapped air: Diagram 12.3>Diagram 12.2
Volume of trapped air in the beaker is inversely propotional to its pressure
Physics concept is Boyle's law

(iii) Beaker will be lifted up due to the trapped air pressure and also the buoyant force from water

QUESTION 13 MIRROR

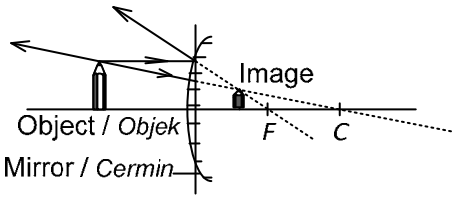
13 **(a)** Reflection

(b) **(i)** Convex mirror

(ii) Has wider view of vision

(iii) Virtual

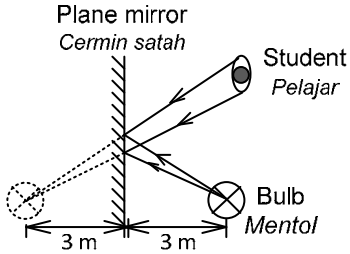
(iv)



(c) **(i)** Reflection

(ii) 6 m

(iii)



(iv) Laterally inverted, virtual, same size

QUESTION 15 SIGHTNESS PROBLEM

15 **(a)** Myopia is short-sightness problem faced by people who cannot see the distant object clearly
Hyper-metropia is long-sightness problem faced by people who cannot see the near object clearly

(b) Refraction

(c) Object distance: Diagram 15.1> Diagram 15.2
Image distance: Diagram 15.1<Diagram 15.2
Far object distance in Diagram 15.1: short-sightness and use concave lens
Near object distance in Diagram 15.2: long-sightness and use convex lens

(d)

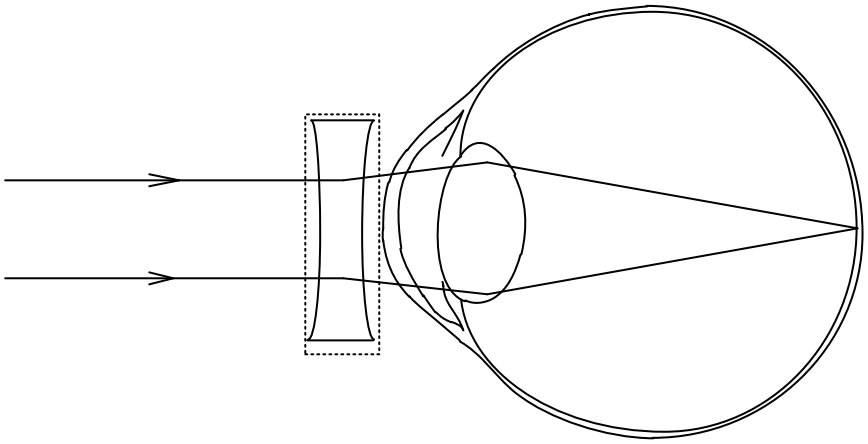
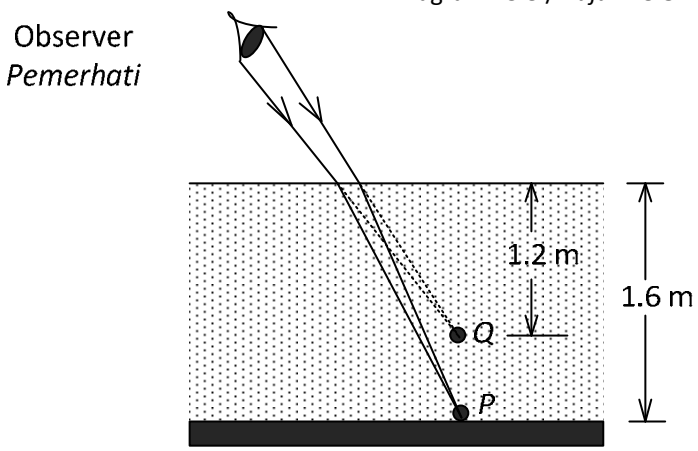


Diagram 15.3 / *Rajah 15.3*

(h) **(i)**



(ii) Refractive index = real depth/apparent depth = 1.6/1.2 = 1.33

QUESTION 16 OPTICAL FIBRE

16 (a) X: refraction Y: total internal reflection

(b) Decrease in the speed of light
The light refracted toward normal

(c) The light ray hit from denser air medium to less dense outer cladding causing the ray refratcted away from normal.
The ray is in total internal reflection as it hits the critical angle of the outer cladding

(d) Note: to make the inner core of the optical fibre. Give reasons for your choice.

Characteristics	Reason
The refractive index must be small	Easier to cause total internal reflection
Low density	Not heavy to carry around
Must be pure	Image formed will not be blurred by impurity
High strength	Does not break
High flexibility	Easy to bend

So, glass K is chosen because it has high refractive index, low densiyy, pure, high strength with high flexibility of glass

QUESTION 17 LIGHT (OPTICAL DEVICES)

17 (a)

Characteristics	Reason
Use convex lens for both objective and eyepiece lenses	Converging the refracted rays
Use bigger diameter of lens	Allow more refraction of light and thus produces brighter and clearer image
Distance between the objective lens and eyepiece is more than the sum of focal length of both lenses	At normal adjustment
Store the microscope at cool and dry place	Prevent the activities of fungus
Use bigger plane mirror underneath the slaid	To project the light to the slaid so that the image formed is brighter

(b) (i) Allow more refraction of light and thus produces brighter and clearer image

(ii) From Power, P = 1/f
Objective lens: 2 = 1/f
f = 0.5 m = 50 cm

Eyepiece lens: 20 = 1/f
f = 0.05 m = 5 cm

(iii) Length of the telescope = 50 cm + 5 cm = 55 cm

(c)

Characteristics	Reason
Use convex lens	Converging the refracted ray
Focal length of objective lens must be big	To view distant object
Focal length of eyepiece lens must be small	Produce big image as big magnification
Diameter of lens must be big	Allow more refraction of light and thus produces brighter and clearer image

So, the telescope S is chosen because it uses convex lens, has big focal length of objective lens, short focal length of eyepiece lens and has big diameter of lens

(d)

Characteristics	Reason
Percentage of light transmitted must be high	Image can be seen brighter
Use convex lens	Converging the refracted rays
Use short focal length	Object being view can be magnified
Use big diameter of lens	Allow more refraction of light and thus produces brighter and clearer image

So, magnifying lens J is chosen because its percentage of light transmitted is high, use convex lens, has short focal length and has big diameter of lens.

(e)

Suggestion	Reason
Use high power of bulb	To form brighter and clearer image
At focal length of the concave mirror	The reflected rays can converge
Use big curvature of mirror	Can receive more light
Slide is put near to the projector lens	At normal adjustment
Screen is put further apart from the projector lens	To magnify the image

(i) To magnify the first image formed by the objective lens

(ii) Real, diminished and inverted

(iii) Virtual, magnified and inverted

(iv) Use bigger diameter of lens for both the objective and eyepiece lens

QUESTION 18 LIGHT (OPTICAL DEVICES)

18

Characteristics	Reason
Use copper wire	Has low resistance
Batteries are connected in series	To increase the potential difference
Use concave reflector	The reflected ray can onverge
Bulb is at principle focus	To produce parallel beams

So, the torchlight S is chosen because it use copper wire, batteries are in series, use concave reflector and bulb is at principle focus.

QUESTION 19 CONCEPT OF REFRACTION, CRITICAL ANGLE AND TOTAL INTERNAL REFLECTION

19 **(a)** Is the maximum incident angle where the refracted rays start to be reflected

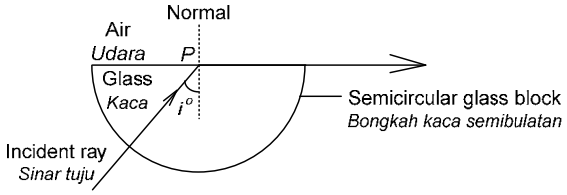
(b) From n = 1/sin C
=1/sin42
= 1.49

(b) **(i)** The refracted ray will away from normal

(ii) From n = sin i/sin r
1.49 = sin r/sin40
r = 73.2°

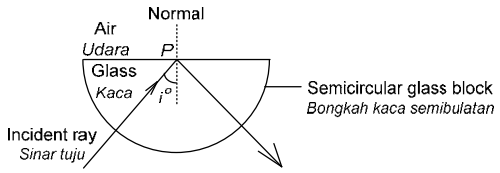
(c) **(i)** r = 90°

(ii)



(c) **(i)** More than 90°

(ii)



(iii) Total internal reflection

QUESTION 20 BERNOULLI' PRINCIPLE

20 **(a)** **(i)** Bernoulli's principle

(ii) States that the region where experience high air speed will has low air pressure and vice-versa

(iii) Aerofoil

(iv) 1st: The aeroplane has to be accelerated before lifting
2nd: Below the wings, the air speed is low but with high air pressure
3rd: Above the wings, the air speed is high but with low air pressure
4th: High air pressure below the wings will push the aeroplane up
5th: principle involved is the Bernoulli's principle

(b)

Characteristics	Reason
The shape of the wing must be aerofoil	Reduce air friction while flying
Area of wings must be big	Can trapped more air pressure
Density of wings must be small	Not too heavy for the aeroplane to support
Different of air speed above and below the wings must be big	Produce more air pressure

So, the design Y is chosen because it shape of wing is aerofoil, area of wings is big, density of wings is small and different of air speed above and below the wings is big

(c)

Characteristics	Reason
Shape of rocket is aerodynamics	Reduce air friction while flying
1/3 of the volume of bottle is filled with water	Increase the momentum of launching force
Add wings to the rocket	The rocket will not wobble while flying
Density of material to the rocket must be small	Not too heavy for the rocket to support
Angle of launching is 45°	To get maximum distance travelled

(d) Note: the car can run very fast

Characteristics	Reason
Shape is inverted aerofoil	Reduce air friction while flying with downward force to the car from lifting
No ridges on tyre	Increase forward force as no friction between tyre and speeding track
Engine power must be high	Produce big acceleration to the racing car
Material for the body of car must be light and elastic	Not too heavy and not too easy to crumple

So, car S is chosen because its shape is inverted aerofoil, no ridge on tyre, high engine power with the material of car body is light and elastic

QUESTION 21 ARCHIMEDES' PRINCIPLE

21 (a) (i) Archimedes' principle states that when the object is immersed partially or wholly into the fluid, the weight of water being displaced is equal to the weight of object being immersed.

(ii) 1st: At low altitude, the air inside the balloon is hot
2nd: Hot air in balloon create an upward force to the balloon to rise up
3rd: When at certain altitude, the air inside is being cooled down.
4th: When the air inside the balloon is cooled, there is no more upward force to lift the balloon and therefore, the balloon stops at certain altitude

(b)

Characteristics	Reason
Big size with high volume of balloon	Can displace more and and thus creates more buoyant force
Use more number of burners	Faster heating up the air inside the balloon as hot air creates upward force
Use synthetic nylon	Resistance to heat
High temperature of air inside	Hot air creates more buoyant force to lift up the balloon

So, balloon Q is chosen because it size and volume of balloon is big, use many burners, made of synthetic nylon and temperature of air inside is high.

(c) (i) From density = mass/volume
0.18 = mass of helium gas/1.2
Mass = 0.216 kg

(ii) Buoyant force, F = *p*Vg
= 1.3 x 1.2 x 10
= 3.6 N

(d) (i) Buoyant force is the upthrust force acting on object which causes the object to float

(ii) 1st: To cause the submarine to submerge, the submarine must gain the weight
2nd: The lower valve of the ballast tank must be opened to let in the sea water.
3rd: When the ballast tank is filled with water, the submarine becomes heavy and start to sink.
4th: The depth of submarine being submerged depends on the volume of ballast tank being filled with water

(iii)

Characteristics	Reason
Volume of ballast tank must be big	Can trap more air to float or can be filled with more water if want to submerge
Number of air tank must be many	Can create more buoyant force
Can tolerate more pressure	Can sink deeper to withstand higher pressure without crack
Shape of submarine must be streamline	Reduce water friction while moving

So, the (2nd) is chosen because it has high volume of ballast tank, have more air tank, can tolerate high pressure and the shape of submarine is streamline.

(e) (i) Volume of the oil drum immersed = surface are x depth sank
= 0.2 x 0.8
= 0.16 m^3

(ii) Buoyant force, F = *p*Vg
= 1000 x 0.16 x 10
= 1600 N

(iii) From F = mg
1600 = m(10)
m = 160 kg

(e) (i) Archimedes' principle

(ii) The boat displaces the water and thus gain the same buoyant force to float the ship

(iii) Equal

(iv) To ensure the maximum weight load limit that can be safely loaded by the ship before the ship starts to sink

(v)

Characteristics	Reason
Material must be low rusting rate //Material used must be high strength	Long lasting without rust Can withstand water pressure
Shape of boat must be streamline	Reduce water friction while moving
Density of boat must be low	Not to heavy but can float
Use periscope	To view hidden object
Install with life-jacket	Can be used by the passenger to float once emergency

QUESTION 22 PASCAL'S PRINCIPLE

22 (a) (i) Pressure can be defined as force acting normally per unit area

(ii) Compare the pressure acted on piston *Q* and *R*: Same
Compare the cross sectional area: Area Q < Area R
Compare force produced: Force at Q < Force at R
Cross sectional area of the pistons is directly proportional to the force produced on the pistons
Pascal's principle

(b) (i) Pascal's principle

(ii) States that for enclosed system, the applied force will be transmitted equally to the whole part inside the system.

(iii) Water evaporates easily at high temperature//Cause the system to rust

(e) Bigger surface area produces higer force

(f) From $F_1/A_1 = F_2/A_2$

$50/2 = F_2/15$

$F_2 = 375$ N

(c)

Characteristics	Reason
The specific heat capacity must be high	Slower getting hot and thus can absorb more heat before getting hot
The melting point of brake disc must be high	Can withstand high temperature without getting melt
Compression of brake fluid must be high	No applied force is wasted to compress the fluid
Hardness of brake pads must be high	Faster transmitting pressure

So, the brake S is chosen because its specific heat capacity is high, melting point of brake disc is high, compression of brake fluid is high with high hardness of brake pads.

(d)

Characteristics	Reason
Liquid used is oil	Will not cause the braking system to rust// Does not easily evaporates at high temperature
Ratio of size piston must be high	Can multiply the input force
Distance between piston must be near	Faster transmitting the applied force to the slave piston
Hardness of hydraulic jack must be hard	No applied force is wasted to compress the fluid

So, the hydraulic jack R is chosen because it uses oil, ratio of size of pistons is big, distance between pistons is near and the hardness of hydraulic jack is high.

QUESTION 23 ELECTRICITY AND OHM'S LAW

23 (a) (i) States that the potential difference across an ohmic conductor is directly proportional to the current flows such that the other physical properties like resistance and heat are kept constant.

(ii) A device which use a input voltage of 240 V and give out the electrical power of 80W //
A device which use a input voltage of 240 V and give out the electrical energy of 80 J in one second

(b) Compare the resistance of materials *Y* and *Z*: Material Y > Material X
Material Y. Can convert the electrical energy to light and heat energy faster

(c) Note: to make a heating element of a water heater

Characteristics	Reason
Cross sectional area must be small	Faster getting hot as big resistance
Melting point must be high	Can withstand high temperature without getting melt
Specific heat capacity must be low	Faster getting hot
Length of wire must be long	High resistance and thus produce more heat

So, the heating element L is chosen because its cross sectional area is small, melting point is high, low specific heat capacity and long length of wire is used.

(d) Current is the rate of charge flow

QUESTION 25 ELECTRICITY AND HEATING ELEMENT

25 (a) A device which use a input voltage of 6 V and give out the electrical power of 24W //
A device which use a input voltage of 6 V and give out the electrical energy of 24 J in one second

(b) Compare the reading of the ammeter: Diagram 25.1= Diagram 25.2
Compare the brightness of the filament lamp *M* and *N*: Lamp M is brighter than lamp N
Compare the thickness of coiled wire of the filament lamps" Lamp M < Lamp N
Brightness of the filament lamp is inversely proportional to the thickness of coiled wire

(c) Two pin plug has only the neutral and live wire but three pin plug has neutral, live and earth wire.
Three pin plug has earth wire to earth the unused current so that it does not electrocute the user.

(d)

Characteristics	Reason
Use nichrome material to make heating element	High resistance and produce heat easily
Shape of heater in coils	More length can be used and thus release more heat
Melting point of element must be high	Can withstand high temperature without getting melt
Rate of rusting must be low	Long lasting without getting melt
The handle of the heating element must be insulated	Does not electrocute the user

QUESTION 26 ELECTRICITY AND HEATING ELEMENT

26 (a) (i) Nichrome. Has high resistance

(ii) From P = IV

1200 = I(240 V)

Current, I = 5 A

(iii) Electrical energy to heat energy

(b) Note: to make connecting wire

Characteristics	Reason
Melting point must be high	Does not melt at high temperature
Density must be low	Not too heavy to install
Level of oxidation must be low	Long lasting without getting rust
Low resistivity value	Does not dissipate current to heat

So, the conductor T is chosen because its melting point is high, low density, low level of oxidation and low resistivity value

QUESTION 26 CURRENT, VOLTAGE AND RESISTANCE COMPARISONS

26 (a) (i) Series

(ii) The current through the battery / *Arus yang mengalir melalui bateri*, $I = I_1 = I_2 = I_3$

The total potential difference across battery / *Beza keupayaan merentasi bateri*, $V = V_1 + V_2 + V_3$

The effective resistance / *Jumlah rintangan berkesan*, $R = R_1 + R_2 + R_3$

(b) (i) Heat, H = mcθ

= 1 x 4200 x (100 – 25)

= 315000 J

(ii) From Power = Energy/Time

2000 = 315000/Time

Time = 157.5 s = 2.625 minutes

(iii) The heat supplied by the immersion heater all are absorbed by the water without loss to the surrounding

(c) Note: light up the lamps labeled '240 V, 1000 W' in office brightly [So, low resistance]

Characteristics	Reason
Voltage are connected in series	Increase the potential difference between two points of connection
Lamps are installed in parallel	Low effective resistance and thus brighter
Install fuse of 5 A [P = IV and 1000 = I x240]	Cut off the current if the current exceeds 5 A
Use copper wire	Has low resistance
Big diameter of connecting wire	Low resistance and less current dissipated as heat

(d)

	Diagram 26.2	Diagram 26.3
Total voltage	12 V x 3 = 36 V	12 V
Total effective resistance	2 Ω + 2 Ω + 2 Ω = 6 Ω	5 Ω
Total power	$P = IV = V^2/R = I^2R$ $= 36^2/6$ = 216 W	$P = IV = V^2/R = I^2R$ $= 12^2/6$ = 24 W

QUESTION 27 FARADAY'S LAW AND LENZ'S LAW

27 (a) lenz's law

(b) States that the direction of induced current is always in opposite direction to the direction which produces it

(c) Diagram 27.1/ *Rajah 27.1*: North pole

Diagram 27.2/ *Rajah 27.2*: South pole

Diagram 27.3/ *Rajah 27.3*: No pole

(d) Induced current

(e) (i) Increases

(ii) Rate of magnetic flux being cut increases

(iii) Faraday's law

(f)

Characteristics	Reason
Strength of magnet must be high	Produce more magnetic flux
Number of turns of coil must be high	More magnetic flux will be cut by moving magnet
Use copper wire	Good conductor with low resistance
Big diameter of wire	Low resistance
High speed of magnet bar moving	Rate cut of magnet increases

QUESTION 28 CONCEPT OF ELECTROMAGNET

28 (a) Region which has the magnet due to the flow of current around a copper coil

(b) Compare the number of turns in solenoid: Diagram 28.1 > Diagram 28.2
Compare the amount of current flowing: same for both diagrams
Compare the number of paper clips attracted to the solenoid: Diagram 28.1 > Diagram 28.2
Number of turns in solenoid is directly proportional to the number of paper clips being attracted
Number of turns of coil is directly proportional to the strength of the magnet being produced

(c) 1st: When the switch is pressed, the circuit is completed and current start to flow
2nd: The current from dry cell flows to the solenoid will generate an magnet around the solenoid
3rd: The magnet around the solenoid will attract the iron armature causing the hammer to hit the gong. Hitting the gong will be repeated before the system demagnetized.
4th: The contact loosens to cut off the current and thus the system demagnetized.

(d) *Note:* to produce the loudest sound

Characteristics	Reason
Size of hammer must be big	Louder sound can be produced
Distance between hammer and gond is big	Create more potential energy to the gong and thus convert to higher kinetic energy to hit the gong
Number of turns of at core is high	Produce more magnetic strength
Curvature of gong must be big	Louder sound

So, the electric bell Q is chosen because its size of hammer is big, distance between hammer and gong is far, has more number of turns at core and big curvature of gong.

QUESTION 29 CONCEPT OF ELECTROMAGNETIC INDUCTION

29 (a) (i) Induced current
(ii) Electromagnetic induction

(b) (i) Produce of current due to the movement of magnet bar around the solenoid
(ii) *A*: North pole *B*: south pole
(iii) Deflect to right

(c)

Characteristics	Reason
Hardness of hair spring is low	Soft and sensitive to small current
Shape of permanent magnet is cylindrical	Centralize the magnet
Shape of core is cylindrical	Centralize the magnet
Type of core must be soft core	Can be magnetized or demagnetized easily
Use linear scale	Easy to read by direct observation

QUESTION 30 TRANSISTOR AS CURRENT AMPLIFIER

30 (a) (i) Transistor
(ii) *p*: base *q*: collector *r*: emitter
(iii) As current amplifier

(b) (i) Microphone / *Mikrofon*: to change the sound energy to electrical signals
(ii) Capacitor / *Kapasitor*: to block the steady current from flowing into the base of transistor
(iii) Resistor *X* and *Y* / *Perintang X dan Y*: as potential divider
(iv) Earphone / *Fon telinga*: to convert the electrical signals to sound energy

(c) 1st: The sound is received by the microphone and converted to electrical signal
2nd: The electrical signal is sent to capacitor
3rd: The capacitor blocks the steady current from the electrical signals but allows the alternating current to the base of transistor.
4th: The current to transistor will be amplified and sent to earphone
5th: Earphone converts the electrical signals back to sound energy

(d) Voltage across resistor X = (3/5) x 24 V = 14.4 V
Voltage across resistor Y = (2/5) x 24 V = 9.6 V

(e) Refer to Question 1(i)

QUESTION 31 APPLICATION OF MIRROR

31 (a) (i) Note: Draw symmetry line after reflection
(ii) Reflection
(iii) Car P cannot see the coming car Q

(b) (i) Convex mirror
(ii) Note: draw symmetry line after reflection
(iii) Produce wider view of vision

(c) (i) Image becomes smaller
(ii) Zoom to wider view

QUESTION 32 WAVE OF OSCILLATED SPRING

Based on the Diagram 32.1 / *Berdasarkan pada Rajah 32.1*:

32 (a) (i) Label from O to 0.2

(ii) From x-axis to highest point of wave

(iii) Time taken to make one complete oscillation

(b) Decrease

(c) Amplitude decreases with time

(d) Correct mark: Amplitude decreases until calm

(e) (i) One type of light//one colour of light

(ii) Due to the interference of red light

(iii) D = 3.0 m, a = 5×10^{-4} m

From diagram, $4x = 1.5 \times 10^{-2}$

$x = 3.75 \times 10^{-3}$

Wavelength, $\lambda = ax/D$

$= (5 \times 10^{-4})(3.75 \times 10^{-3})/3$

$= 6.25 \times 10^{-7}$ m

(iv) Distance between two consecutive dark fringes decreases

Blue light has shorter wavelength than red light. Shorter wavelength, nearer distance between two consecutive dark fringes.

QUESTION 33 SOUND WAVE

33 (a) (i) Longitudinal wave

(ii) N

(iii) Higher frequency, shorter wavelength

(b) From $v = f\lambda$

$330 = 586 \times \lambda$

$\lambda = 0.56$ m

(c) Refer to teacher

(d) Refer to teacher

QUESTION 34 MOMENTUM, IMPULSE AND IMPULSIVE FORCE

34 (a) Is the product of mass and velocity

(b) From momentum = mass x velocity

$= 0.080$ kg $\times 100$ ms^{-1}

$= 8$ kgms^{-1}

(c) Velocity decreases

(d) 1st: when catching a fast moving ball, the time in contact between the ball and hand is short

2nd: Smaller time of impact, bigger force produced

(e) (i) Is the rate of change of impulse

(ii) Impulsive force, $F = ma = m(v-u)/t$

$= 0.15 \times 20/(8.0 \times 10^{-2})$

$= 37.5$ N

(iii) Impulsive force will be reduced.

Because the time of impact increases

(iv) Impulse is the change of momentum

QUESTION 35 APPLICATION OF TRANSFORMER

35 (a) To step up or step-down the input a.c voltage

(b) (i) Big number of turns of primary but less turns of secondary coil for Transformer *X*

Can step-down the high input a.c voltage to low value before supplied to users

(ii) Type of core of the transformer must be laminated and soft

Laminated as to reduce eddy current and must be soft so that it can be magnetized or demagnetized easily

(iii) Material of transmission wire is aluminium

Low cost with low rusting rate

(iv) Electric transmission model R

(c) (i) Input power, $P = IV = 0.1 \times 240 = 24$ W

Output power $= 2.0 \times 9 = 18$ W

Efficiency = (output power/input power) x 100%

$= (18/24) \times 100\%$

$= 75\%$

(ii) Power loss = 24 W – 18 W = 6 W

QUESTION 36 PRESSURE IN LIQUID

36 **(a)** Pressure is the force acting normally per unit area

(b) Density of liquid

(c) Pressure at X = hpg

= 10 x 1000 x 10

= 1.0×10^5 Pa

(d) Because the water tank of building is higher than the water tank source

(e) **(i)** Install big water tank at the roof of the tall building

(ii) Use motor to pump the water out//increase the height of main water tank source

(f) Build one water tank at the top of the tall buildings

So that the pressure of water can be increased before supplied to the tenants inside the building

(g) Pressure of the gas supply = 76 + unbalance

= 76 + 15 – 5

= 86 cmHg

QUESTION 37 CONCEPT OF DENSITY AND ARCHIMEDES' PRINCIPLE

37 **(a)** **(i)** Archimedes' principle

(ii) Mark up: buoyant force

Mark down: weight of hydrometer

The hydrometer is removed from water, dried and then placed in oil.

Hidrometer itu dikeluarkan dari air, dikeringkan dan dimasukkan ke dalam minyak.

(b) **(i)** Length of the hydrometer that is submerged in oil increases

(ii) Oil has lower density than water

(c) **(i)** Buoyant force = 0.25 N – 0.22 N

= 0.03 N

(ii) Buoyant force, F = pVg

$0.03 = 1000 \times V \times 10$

$V = 3.0 \times 10^{-6}$ m

(d) **(i)** F = buoyant force//upthrust

W = weight

(ii) Equal

(iii) F = mg = 200 x 10 = 2000 N