

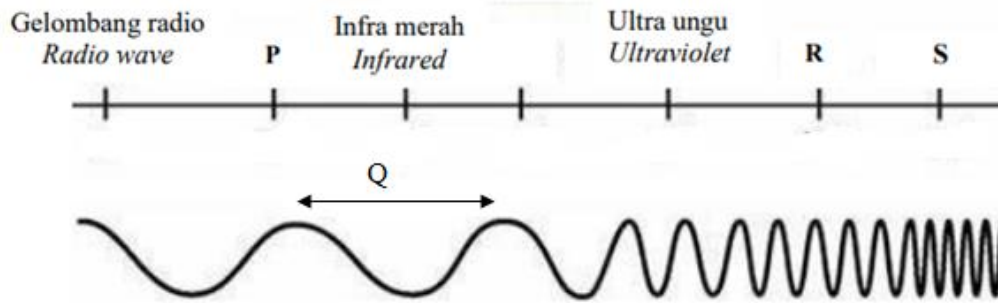
Bahagian / Section A

[60 markah/ marks]

Jawab **semua** soalan / Answer **all** questions

1. Rajah 1 menunjukkan suatu spektrum elektromagnet.

Diagram 1 shows an electromagnetic spectrum.



Rajah / Diagram 1

- (a) Tandakan (X) pada jawapan yang betul bagi melengkapi pernyataan berikut

Mark (X) at the correct answer to complete the following statement

Spektrum selanjar

Continuous spectrum

☐

Spektrum garis

Line spectrum

☐

[1 markah/ mark]

- (b) Namakan kuantiti fizik yang diwakili oleh Q.

Name the physical quantity represents by Q.

[1 markah/ mark]

- (c) (i) Berdasarkan Rajah 1, nyatakan jenis gelombang P

Based on Diagram 1, state the type of wave P.

[1 markah/ mark]

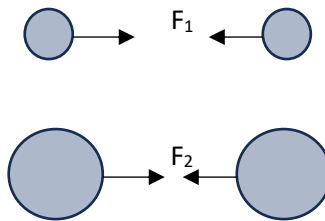
(ii) Bandingkan frekuensi gelombang P dan S.

Compare the frequency of wave P and S.

[1 markah/ mark]

2. Rajah 2 menunjukkan kesan terhadap daya graviti disebabkan oleh jisim antara dua jasad.

Diagram 2 shows the effect of mass between two bodies on gravitational force.



Rajah / Diagram 2

- (a) Namakan daya F_1 dan F_2 yang bertindak ke atas dua jasad di atas.

Name the force F_1 and F_2 acted on the two bodies as above.

[1 markah/ mark]

- (b) Tentukan magnitud daya graviti jika jasad dengan jisim lebih besar digunakan.

Determine the magnitude of gravitational force if the larger masses of bodies are used.

[1 markah/ mark]

- (c) Hitung daya graviti antara Bumi dengan satelit buatan manusia. Diberi
Calculate the gravitational force between the Earth and the man-made satellite.
Given

[Jisim Bumi / *Mass of the Earth*: 5.97×10^{24} kg]

[Jejari Bumi / *Radius of the Earth*: 6.37×10^8 m]

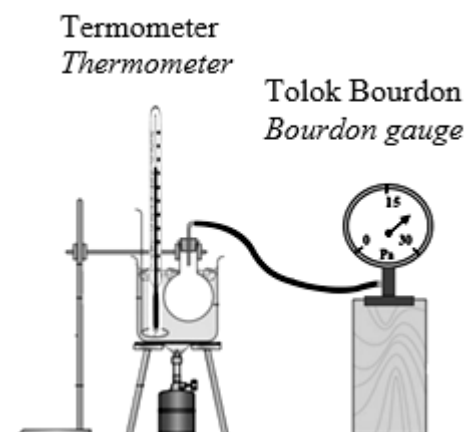
[Jisim satelit / *Mass of the satellite*: 1.20×10^3 kg]

[Jarak Bumi dengan satelit / *Distance of Earth and satellite*: 4.22×10^7 m]

[3 markah / marks]

- 3 Rajah 3 menunjukkan bacaan tolok Bourdon apabila air dipanaskan di dalam sebuah kelalang dasar bulat. Suhu awal air adalah 25°C .

Diagram 3 shows the reading of the Bourdon gauge when air is heated in a round bottom flask. The initial temperature of water is 25°C .



Rajah/Diagram 3

- (a) Namakan kuantiti fizik yang diukur oleh tolok Bourdon.
Name the physical quantity measured by Bourdon gauge.

[1 markah / mark]

- (b) Berdasarkan Rajah 3, nyatakan hukum gas yang terlibat.

Based on Diagram 3, state the gas law involved.

[1 markah/ mark]

- (c) Berdasarkan Teori Kinetik Gas, jelaskan hubungan antara tekanan udara dalam kelalang dasar bulat dengan suhu.

Based on Kinetic Theory of Gas, explain the relationship between the pressure of air in the round bottom flask with temperature

[2 markah/ marks]

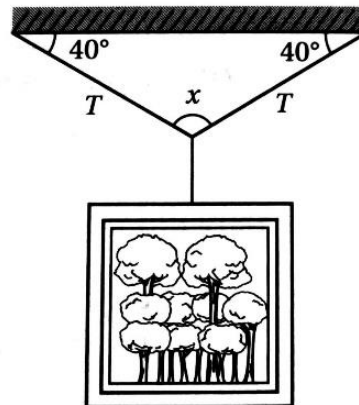
- (d) Berdasarkan Rajah 3, hitung tekanan di dalam kelalang dasar bulat apabila air dipanaskan sehingga 80°C .

Based on Diagram 3, calculate the pressure in the round bottom flask when the water is heated to 80°C .

[2 markah/ marks]

- 4 Rajah 4 menunjukkan sebuah bingkai gambar yang berjisim 4.3 kg digantung pada dinding menggunakan seutas tali.

Diagram 4 shows a photo frame with mass of 4.3 kg that is hung onto a wall using a string



Rajah / Diagram 4

- (a) Apakah dimaksudkan dengan berat? / What is meant by weight?

[1 markah / mark]

- (b) Berdasarkan Rajah 4, lukis segi tiga daya pada ruangan di bawah.

Based on Diagram 4, draw the triangle of forces in the space below.

[2 markah / marks]

- (c) Tentukan / Determine

- (i) berat bingkai gambar / weight of the photo frame

[2 markah / marks]

(ii) tegangan tali / *tension of string*

[3 markah/ marks]

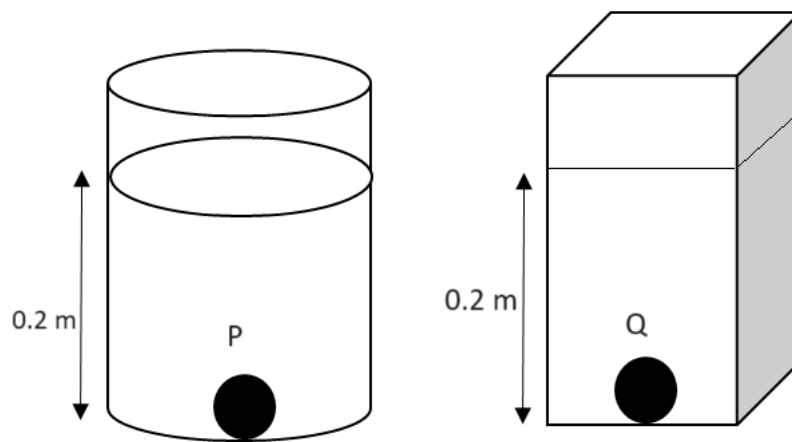
(d) Apakah yang akan berlaku pada T jika sudut x bertambah?

What will happen to T if the angle of x is increases?

[1 markah / mark]

5 Rajah 5 menunjukkan dua bekas berlainan yang diisi dengan air.

. *Diagram 5 shows two different containers filled with water*



Rajah / Diagram 5

(a) Apakah maksud tekanan?

What is the meaning of pressure?

[1 markah/ mark]

(b) (i) Bandingkan tekanan pada titik P dan Q.

Compare the pressure at point P and Q

[1 markah/mark]

(ii) Hitung tekanan air pada titik P. Diberi

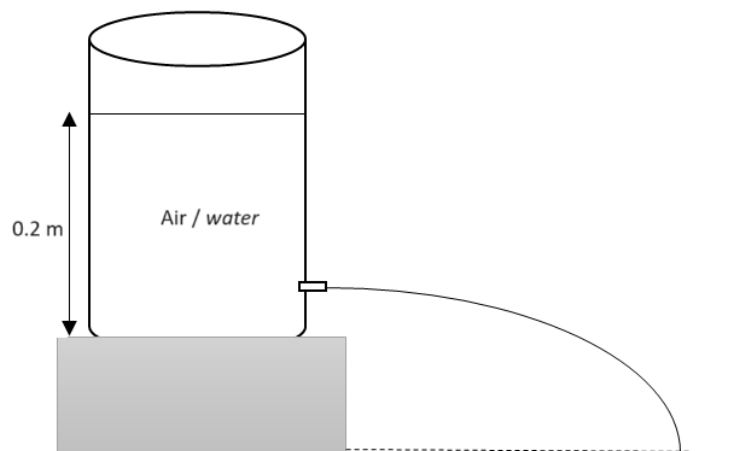
Calculate the water pressure at point P. Given

[Ketumpatan air / *Density of water* = 1000 kg m^{-3}]

[2 markah/ *marks*]

(c) Rajah 5 (a) menunjukkan pancutan air dari satu lubang di dasar suatu bekas

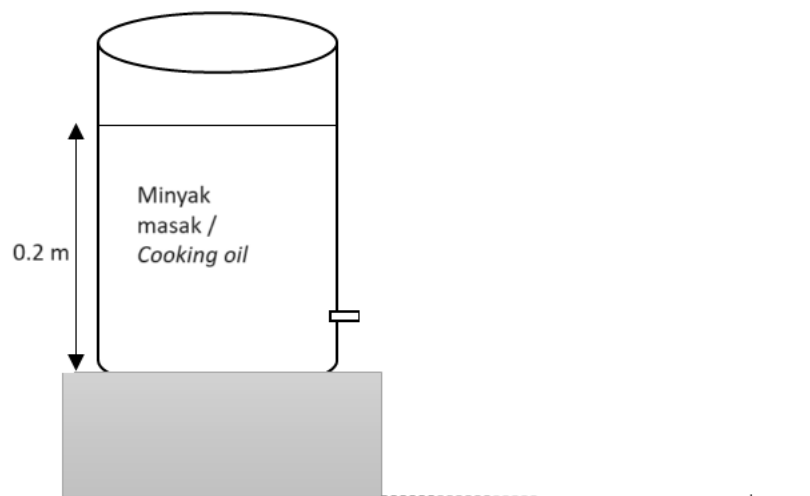
Diagram 5 (a) shows the spurting of water from a hole at the base of a container.



Rajah/ *Diagram* 5 (a)

Rajah 5 (b) menunjukkan minyak masak diisi dalam bekas yang sama bagi menggantikan air.

Diagram 5 (b) shows cooking oil is filled in the same container replacing the water.



Rajah/*Diagram* 5 (b)

Pada Rajah 5 (b) lukis pancutan bagi minyak masak dari lubang yang sama.

On Diagram 5 (b) draw the spurting of cooking oil from the same hole.

[1 markah/ mark]

(d) Berdasarkan jawapan di 5 (c) bandingkan

(i) jarak pancutan bagi kedua – dua air dan minyak masak.

spurting distance for both water and cooking oil.

[1 markah / mark]

(ii) ketumpatan air dan minyak masak.

density of water and cooking oil.

[1 markah / mark]

(iii) Nyatakan hubungan antara jarak pancutan dengan ketumpatan.

State the relationship between the spurting distance and density.

[1 markah/ mark]

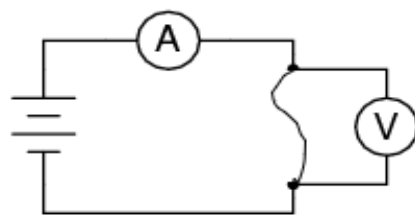
(e) Ramalkan apakah yang akan berlaku pada jarak pancutan jika alkohol digunakan.

Predict what will happen to the distance of the spurt if alcohol is used.

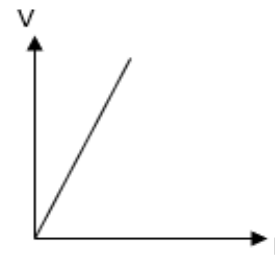
[1 markah / mark]

6. Rajah 6.1 (a) dan 6.2 (a) menunjukkan dua susunan litar yang mengkaji hubungan antara beza keupayaan dengan arus dalam satu dawai pengalir. Rajah 6.1 (b) dan 6.2 (b) menunjukkan graf beza keupayaan melawan arus yang sepadan dengan Rajah 6.1 (a) dan 6.2 (a) masing-masing. Rintangan bagi dawai pengalir tersebut diwakili oleh kecerunan graf.

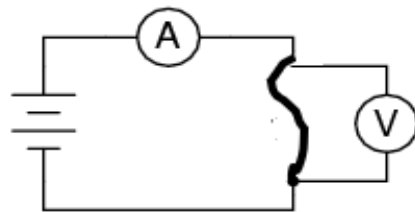
Diagram 6.1 (a) and 6.2 (a) show two circuit set ups that investigate the relationship between potential difference and electrical current in a conductor wire. Diagram 6.1 (b) and 6.2 (b) show the graphs of potential difference against electrical current that matches with Diagram 6.1 (a) and 6.2 (a) respectively. The resistance of the conductor wire is represented by the gradient of the graph



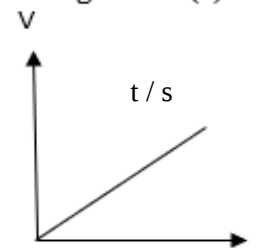
Rajah 6.1(a)
Diagram 6.1(a)



Rajah 6.1(b)
Diagram 6.1(b)



Rajah 6.2(a)
Diagram 6.2(a)



Rajah 6.2(b)
Diagram 6.2(b)

- (a) Apakah maksud rintangan?

What is the meaning of resistance?

[1 markah / mark]

- (b) Berdasarkan Rajah 6.1 dan 6.2, bandingkan

Based on Diagram 6.1 and 6.2, compare

- (i) ketebalan dawai pengalir

thickness of constantan wire

[1 markah / mark]

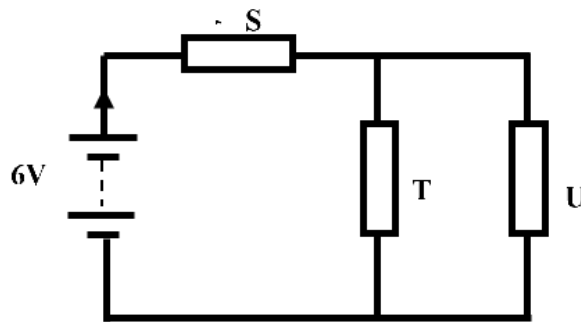
- (ii) rintangan bagi dawai pengalir
resistance of the conductor wire

[1 markah / mark]

- (c) Hubungkan ketebalan dawai dengan rintangan.
Relate the thickness of conductor wire with resistance.

[1 markah / mark]

- (d) Rajah 6.3 menunjukkan tiga perintang S, T dan U dengan nilai rintangan setiap satu ialah $20\ \Omega$ yang disambungkan ke satu sel kering 6 V membentuk satu litar lengkap.
Diagram 6.3 shows three resistors S, T and U with resistance of $20\ \Omega$ each that are connected to a 6 V dry cell forming a complete circuit.



Rajah / Diagram 6.3

Berdasarkan Rajah 6.3, hitung / *Based on Diagram 6.3, calculate*

- (i) rintangan berkesan litar itu. / *effective resistance of the circuit.*

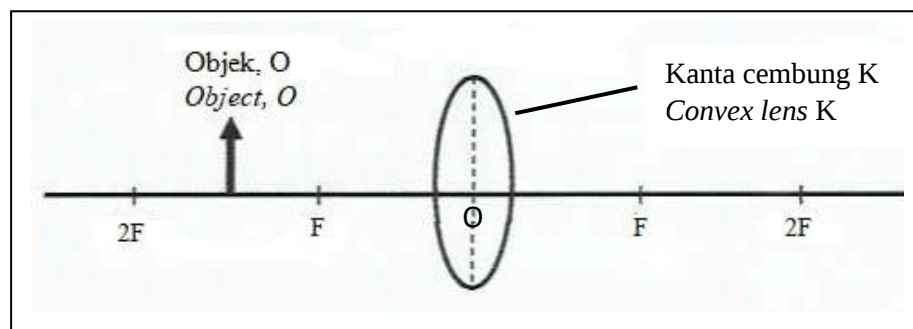
[2 markah/ marks]

(ii) kuasa yang dilesapkan oleh perintang S / *power dissipated by resistor S*

[3 markah/ marks]

7. Rajah 7 menunjukkan suatu objek, O diletakkan di hadapan suatu kanta cembung K. Panjang fokus kanta cembung itu ialah 4 cm.

Diagram 7 shows an object, O is placed in front of a convex lens, K. The focal length of the convex lens K is 4 cm



Rajah / Diagram 7

- (a) Apakah maksud panjang fokus?
What is the meaning of focal length?

[1 markah/ mark]

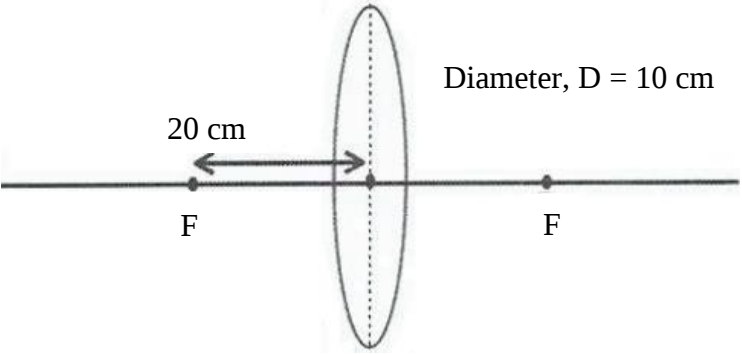
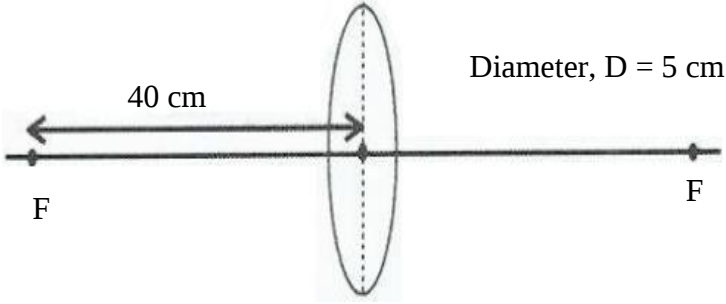
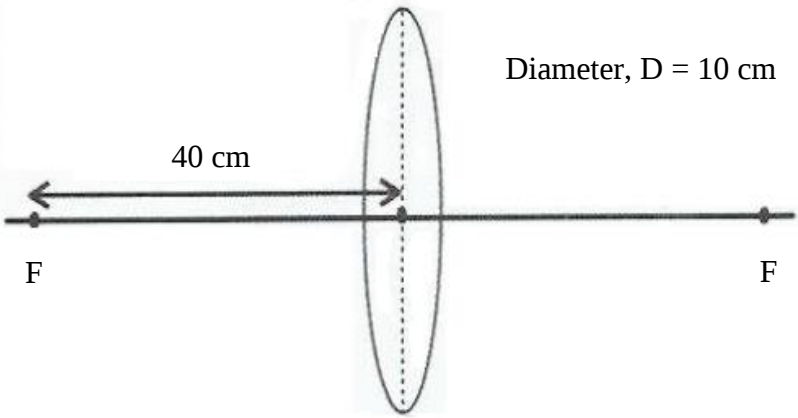
- (b) Pada Rajah 7, lukis satu rajah sinar yang akan membentuk satu imej
On Diagram 7, draw a ray diagram that will form an image.

[3 markah/ marks]

- (c) Kanta cembung K bertindak sebagai kanta mata dan perlu digabungkan dengan kanta objektif untuk membina sebuah teleskop astronomi. Kanta cembung P, Q dan R boleh digunakan sebagai kanta objektif.
Convex lens K acts as an eyepiece lens and need to be combined with an objective lens to build an astronomical telescope. Convex lens P, Q and R can be used as the objective lens.

Jadual 7 menunjukkan ciri-ciri tiga kanta cembung P, Q dan R

Diagram 7 shows characteristics of three convex lens P, Q and R.

Kanta cembung / Convex lens P	
Kanta cembung / Convex lens Q	
Kanta cembung / Convex lens R	

Jadual / Table 7

Berdasarkan Jadual 7, nyatakan ciri-ciri yang sesuai bagi kanta objektif yang dapat menghasilkan imej yang lebih besar dan jelas. Nyatakan sebab untuk kesesuaian ciri tersebut.

Based on the information Table 7, state the suitable characteristics of the objective lens which can produce larger and clearer images. State reason for the suitability of the characteristics.

(i) Panjang fokus / *Focal length*

Sebab / *Reason*

[2 markah/ *marks*]

(ii) Diameter / *Diameter*

Sebab / *Reason*

[2 markah/ *marks*]

(d) Berdasarkan jawapan anda di 7 (c), pilih kanta cembung yang paling sesuai digunakan sebagai kanta objektif bagi teleskop astronomi tersebut.

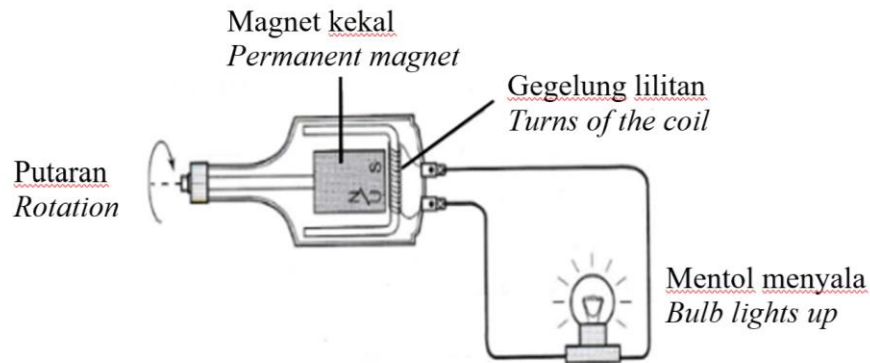
Based on your answer in 7 (c), choose the most suitable convex lens to be used as an objective lens for an astronomical telescope.

[1 markah/ *mark*]



8. Rajah 8.1 menunjukkan suatu magnet kekal dalam satu dinamo basikal yang berputar pada kelajuan tinggi.

Diagram 8.1 shows a permanent magnet in a bicycle's dynamo that rotates at a high speed.



Rajah / Diagram 8.1

- (a) (i) Nyatakan perubahan tenaga yang berlaku pada dinamo itu.

State the energy changes that takes place at the dynamo.

[1 markah/ mark]

- (ii) Nyatakan konsep fizik yang terlibat.

State the physics concept involved.

[1 markah/ mark]

- (b) Rajah 8.2 menunjukkan seorang lelaki sedang berbasikal pada waktu malam. Lampu basikalnya masih malap walaupun lelaki itu mengayuh basikalnya dengan laju.

Diagram 8.2 shows a man cycling at night. His bicycle's lamp is still dim although the man pedalling his bicycle faster.



Rajah / Diagram 8.2

Cadangkan pengubahsuaian yang boleh dilakukan kepada dinamo basikal bagi meningkatkan kecerahan mentol. Beri sebab kepada jawapan anda.

Suggest the modifications need to be done to the bicycle's dynamo to increase the brightness of the bulb. Give reason to your answer.

(i) Kekuatan magnet. / *Strength of magnet*

Sebab / *Reason*

[2 markah / *marks*]

(ii) Bilangan lilitan gegelung dawai. / *Number of turns of coil.*

Sebab / *Reason*

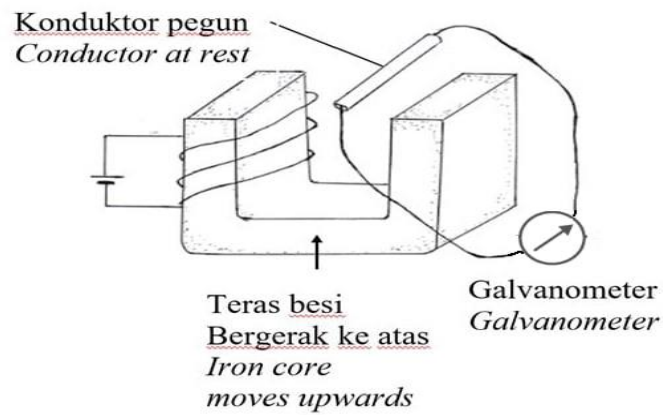
[2 markah / *marks*]

(iii) Bahan gegelung dawai / *Material of coil of wire.*

Sebab / *Reason*

[2 markah / *marks*]

- (c) Rajah 8.3 menunjukkan suatu arus diaruhkan apabila teras besi bentuk U digerakkan ke atas.
Diagram 8.3 shows a current is induced when the U-shaped iron core is moved upward



Rajah / Diagram 8.3

Pada Rajah 8.3, tandakan arah arus yang mengalir pada konduktor.pegun
On Diagram 8.3, mark the direction of current flow in the stationary conductor.

[1 markah / mark]

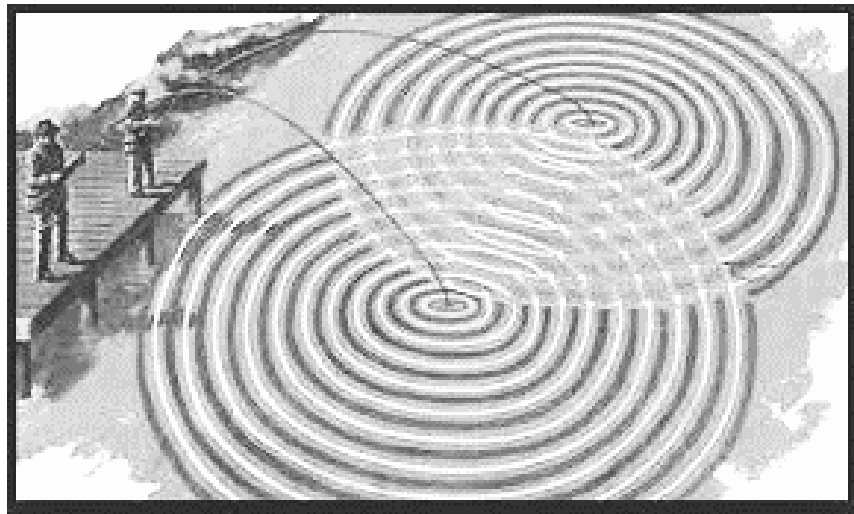
Bahagian / Section B

[20 markah/ marks]

Jawab mana – mana **satu** soalan
*Answer any **one** of the questions*

9. Rajah 9.1 menunjukkan dua lelaki sedang memancing di tepi tasik. Kedua-dua lelaki ini menggunakan joran yang sama panjang. Apabila kedua – dua joran dilemparkan serentak, satu set corak gelombang air terbentuk.

Diagram 9.1 shows two men are fishing by a lake. Both of them use same length of fishing rods. When both fishing rods are thrown simultaneously into the water, a set of water wave pattern is formed.



Rajah / Diagram 9.1

- (a) Apakah yang dimaksudkan dengan sumber koheren?

What is meant by coherent sources?

[1 markah / mark]

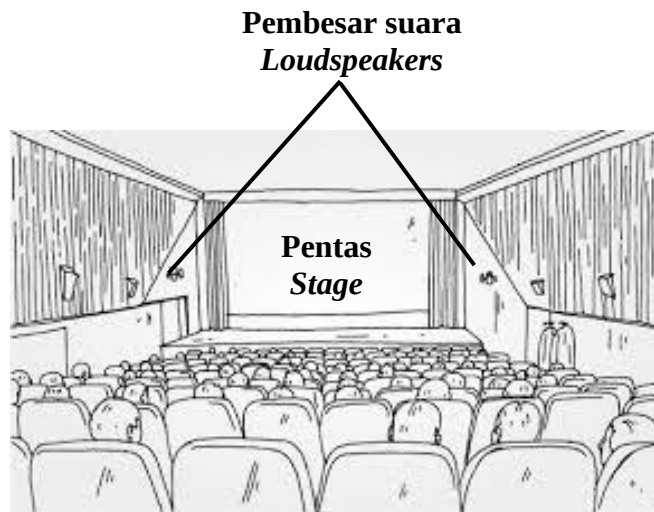
- (b) Terangkan bagaimana interferens membina dan memusnah terbentuk.

Explain how constructive and destructive interferences are formed.

[4 markah / marks]

- (c) Rajah 9.2 menunjukkan susunan tempat duduk bagi sebuah dewan tertutup.

Diagram 9.2 shows the seating arrangement in an indoor hall



Rajah / Diagram 9.2

Jadual 9 menunjukkan empat jenis sistem bunyi yang akan digunakan dalam dewan tertutup

Table 9 shows four type of sound system to be used in the indoor hall.

Sistem bunyi <i>Sound system</i>	Kedudukan pembesar suara <i>Position of loudspeakers</i>	Jarak antara dua pembesar suara <i>Distance between two loudspeakers</i>	Bahan penutup dinding <i>Material to cover the wall</i>	Kedudukan mikrofon <i>Position of microphone</i>
W	Tinggi <i>High</i>	Kecil <i>Small</i>	Papan lembut <i>Soft board</i>	Di belakang pembesar suara <i>Behind speakers</i>
X	Rendah <i>Low</i>	Besar <i>Large</i>	Kayu keras <i>Hard wood</i>	Di hadapan pembesar suara <i>In front of speakers</i>
Y	Tinggi <i>High</i>	Besar <i>Large</i>	Papan lembut <i>Soft board</i>	Di belakang pembesar suara <i>Behind speakers</i>
Z	Rendah <i>Low</i>	Kecil <i>Small</i>	Kayu keras <i>Hard wood</i>	Di hadapan pembesar suara <i>In front of speakers</i>

Jadual / Table 9

Berdasarkan Jadual 9, anda dikehendaki menentukan rekabentuk sistem bunyi yang boleh digunakan di dewan itu bagi menghasilkan kualiti bunyi yang baik dan lebih jelas sepanjang majlis berlangsung. Terangkan kesesuaian setiap ciri dan tentukan sistem bunyi yang paling sesuai digunakan. Beri sebab anda bagi setiap pilihan.

Based on Table 9, you are required to determine the sound system's design that could be used in producing a good and more obvious sound quality during the event takes place. Explain each suitability and determine the most suitable sound system to be used. Give reasons for your choice.

[10 markah / marks]

- (d) Dalam satu eksperimen yang mengkaji interferens gelombang bunyi, dua pembesar suara disambung kepada sebuah penjana isyarat audio yang mengeluarkan bunyi dengan frekuensi 1200 Hz. Seorang pelajar terdengar bunyi kuat dan bunyi lemah berselang-seli di sepanjang satu garis lurus yang 20 m dari pembesar suara.

In an experiment which study the phenomenon involving sound waves, two speakers are connected to an audio signal generator which produces a sound with frequency of 1200 Hz. A student heard an alternating loud and soft sound while walking along a straight line of 20 m from the loudspeakers

- (i) Jika halaju bunyi dalam udara ialah 300 m s^{-1} , hitung panjang gelombang bunyi tersebut.

If the speed of sound in air is 300 m s^{-1} , calculate the wavelength of the sound wave

[2 markah / marks]

- (ii) Jika jarak di antara dua pembesar itu ialah 3.0 m, hitung jarak terdekat di antara kawasan bunyi lemah dengan kawasan bunyi lemah yang berturutan.

If the distance between two speakers is 3.0 m, determine the shortest distance between the weak sound with a weak sound.

[2 markah / marks]

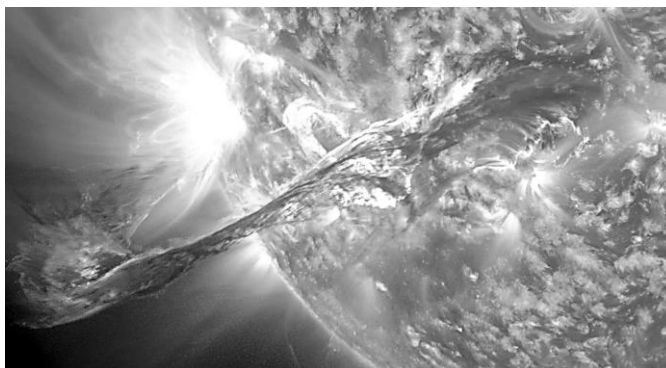
- (iii) Apakah yang akan berlaku pada jarak bunyi kuat dan lemah yang berturutan jika jarak antara dua pembesar suara bertambah?

What will happen to the distance of a consecutive loud and soft sound if the distance between the loudspeakers is increased?

[1 markah / mark]

10. Rajah 10.1 menunjukkan tenaga cahaya dan haba terpancar ke permukaan Matahari apabila tindak balas nuklear berlaku di teras Matahari di bawah tekanan sangat tinggi.

Diagram 10.1 shows light and heat energy radiated to the surface of the Sun when nuclear reaction occurs in the core of the Sun under very high pressure.



Rajah / Diagram 10.1

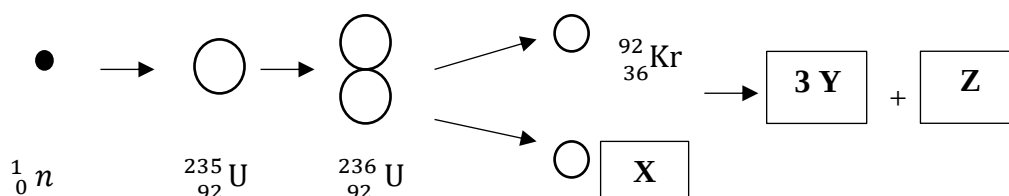
- (a) Apakah yang dimaksudkan dengan tenaga nuklear?

What is meant by nuclear energy?

[1 markah / mark]

- (b) Rajah 10.2 menunjukkan pembelahan nukleus yang menghasilkan tenaga nuklear.

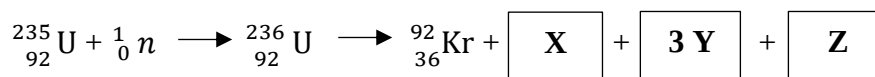
Diagram 10.2 shows the nuclear fission that produce nuclear energy.



Rajah / Diagram 10.2

Berdasarkan Rajah 10.2, lengkapkan persamaan berikut.

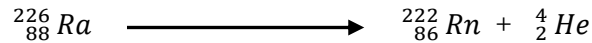
Based on Diagram 10.2, complete the following equation.



[3 markah / marks]

- (c) Persamaan berikut menunjukkan satu pereputan nuklear di mana jumlah jisim hasil pereputan sentiasa kurang daripada jumlah jisim nukleus radioaktif yang dikenali sebagai cacat jisim.

The equation shows a radioactive decay which the total mass of decay products is always less than the total mass of the radioactive nucleus which is known as mass defect.



Diberi jisim bagi setiap bahan radioaktif adalah seperti berikut:

Given the mass of each radioactive substances are as follow:

Ra: 226.54 u.j.a / amu Rn: 222.018 u.j.a / amu He : 4.003 u.j.a / amu

- (i) Hitung cacat jisim bagi tindak balas nuklear di atas.

Calculate the mass defect of the nuclear reaction above.

[2 markah / marks]

- (ii) Hitung tenaga nuklear yang dihasilkan daripada tindak balas pereputan radioaktif tersebut.

Calculate the nuclear energy produced from the radioactive decay process.

Diberi $1 \text{ u.j.a} = 1.66 \times 10^{-27} \text{ kg}$ dan laju cahaya dalam vakum, $c = 3.00 \times 10^8 \text{ m s}^{-1}$

Given $1 \text{ amu} = 1.66 \times 10^{-27} \text{ kg}$ and speed of light in vacuum, $c = 3.00 \times 10^8 \text{ m s}^{-1}$

[3 markah/ marks]

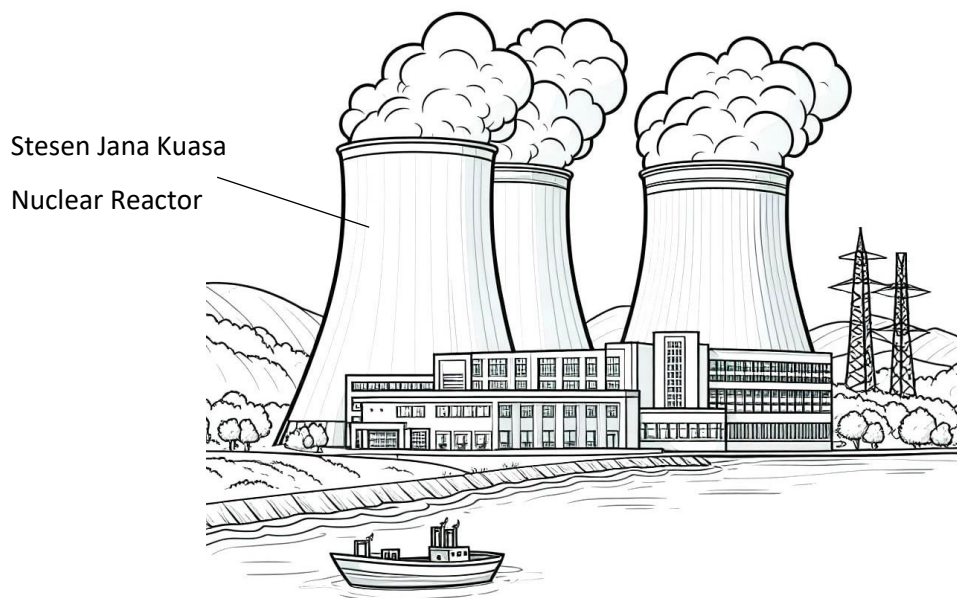
- (d) Apakah tindak balas nuklear yang berlaku di dalam janakuasa nuklear untuk menghasilkan tenaga elektrik?

What is the nuclear reaction that takes place in nuclear reactor to generate electrical energy?

[1 markah/ mark]

- (e) Rajah 10.3 menunjukkan janakuasa nuklear yang ingin dibina bagi menggantikan tenaga sedia ada sebagai tenaga alternatif di kawasan X.

Diagram 10.3 shows a nuclear reactor is being built to replace the existence energy as an alternative energy in area X.



Rajah / Diagram 10.3

Jadual 2 menunjukkan empat model janakuasa nuklear yang hendak dibina bagi menggantikan janakuasa tenaga sedia ada di kawasan X.

Table 2 shows four nuclear reactors which will be built to replace the existing energy reactor in area X.

Janakuasa nuklear Nuclear Reactor	Keadaan radioisotope State of radioisotope	Separuh hayat Half – life	Rod Pengawal Control Rod	Moderator/ Moderator
P	Cecair <i>Liquid</i>	Panjang <i>Long</i>	Air masin <i>Saltwater</i>	Kadmium <i>Cadmium</i>
Q	Pepejal <i>Solid</i>	Panjang <i>Long</i>	Boron <i>Boron</i>	Grafit <i>Graphite</i>
R	Cecair <i>Liquid</i>	Pendek <i>Short</i>	Kadmium <i>Cadmium</i>	Air masin <i>Saltwater</i>
S	Pepejal <i>Solid</i>	Pendek <i>Short</i>	Grafit <i>Graphite</i>	Boron <i>Boron</i>

Jadual / Table 2

Anda selaku jurutera nuklear diminta untuk mengkaji ciri – ciri janakuasa yang selamat untuk menghasilkan jumlah tenaga elektrik yang besar. Tentukan janakuasa nuklear yang paling sesuai dan beri sebab kepada pilihan anda.

As a nuclear engineer, you are asked to investigate the characteristics of a reactor which is suitable to generate greater amount of electrical energy safely. Determine the most suitable nuclear reactor and give reasons for your choice.

[10 markah/ marks]

Bahagian / Section C

[20 markah/ marks]

Jawab **semua** soalan/ Answer **all** question

11. Rajah 11.1 menunjukkan seorang lelaki menarik seorang budak yang duduk di atas daun upih. Budak itu ditarik sejauh 50 m dalam masa 1 minit. Rajah 11.2 menunjukkan seorang lagi budak naik ke atas daun upih yang sama dan ditarik dengan menggunakan daya yang sama sejauh 30 m dalam masa 1 minit.

Diagram 11.1 shows a man is pulling a boy who sits on an upih leaf. The boy is pulled at distance of 50 m in a minute. Diagram 11.2 shows another boy sits on the same upih leaf and is pulled using the same force at a distance of 30 m in a minute.



Rajah / Diagram 11.1



Rajah / Diagram 11.2

- (a) Apakah maksud daya? / What is the meaning of force?

[1 markah / mark]

- (b) Berdasarkan Rajah 11.1 dan Rajah 11.2,
Based on Diagram 11.1 and Diagram 11.2,

- (i) Bandingkan jumlah jisim, jarak yang dilalui dan pecutan yang dihasilkan.

Compare the total mass, distance travelled and acceleration produced.

- (ii) Hubungkait jumlah jisim dengan jarak yang dilalui untuk membuat satu kesimpulan berkaitan hubungan antara jisim dengan pecutan.

Relate the total mass with the distance travelled to make a deduction regarding the relationship between total mass and acceleration.

[5 markah / marks]

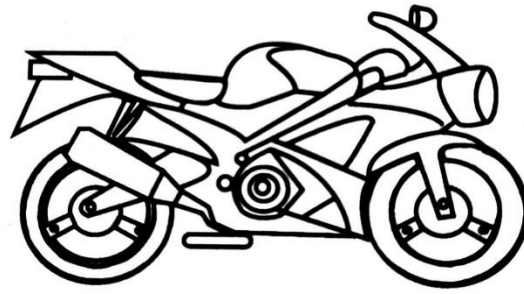
- (c) Objek dengan jumlah jisim yang lebih besar memerlukan daya yang lebih besar untuk memecut. Huraikan pernyataan ini.

Objects with greater total mass require greater force to accelerate. Explain the statement.

[4 markah / marks]

- (d) Rajah 11.3 menunjukkan sebuah motosikal perlumbaan.

Diagram 11.3 shows a racing motorcycle.



Rajah / Diagram 11.3

Berdasarkan pengetahuan anda mengenai konsep inertia, cadangkan pengubahsuaian yang boleh dilakukan ke atas motosikal tersebut agar boleh memecut lebih laju dan selamat berdasarkan sifat bahan motosikal dan aspek keselamatan tambahan lain yang diperlukan. Beri penerangan bagi setiap aspek yang dinyatakan.

Based on your knowledge regarding the concept of inertia, suggest modifications that can be made to the motorcycle to accelerate faster, and safer based on properties of material of the motorcycle and other additional safety features needed. Give explanation to each of the aspects stated.

[10 markah /marks]