



***PHYSICS***  
***Workshop***  
***2022***

TSUN JIN  
High school  
2022

## Physics workshop

### SPM KSSM 2022

- Paper 1 – 40 objectives – 1 hour 15 min
- Paper 2- 8 structures (60 marks) Format 456 99999  
and 3 Essay (part B – 2 choose 1) 20 marks  
(part C -1 compulsory) 20 marks  
2 hours 30 mins
- Paper Practical 1 questions (Solo) 15 marks - 45 minutes

#### Paper 1 (KSSM SPM)

##### Form 4

- 1- measurement
- 2-Force and motion 1
- 3- Gravitation
- 4-Heat
- 5- Waves
- 6- Light

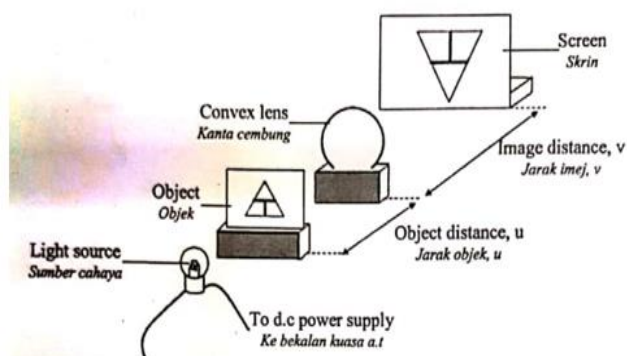
##### Form 5

- 1- Force and motion 2
- 2-Pressure
- 3- Electricity
- 4-Electromagnetism
- 5- Electronics
- 6- Nuclear Physics
- 7- Quantum Physics

## KSSM Objective

1.

4 Rajah menunjukkan satu susunan eksperimen untuk menyiasat hubungan antara jarak objek,  $u$  dan jarak imej,  $v$ .



Graf manakah yang menunjukkan hubungan antara  $v$  dan  $u$  yang betul?

Diagram show an arrangement of an experiment to investigate the relationship between object distance,  $u$  and image distance,  $v$ .

Which of the following statement true about the above experiment?

	Manipulated variable	Constant variable	Responding variable
A	Image distance	Power of lense	Object distance
B	Power of lense	Object distance	Image distance
C	Object distance	Power of lense	Image distance
D	Type of lense	Power of lense	Image distance

2.

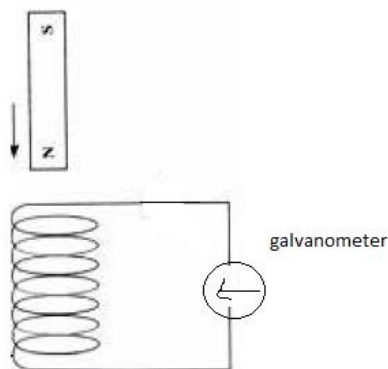


Diagram show an arrangement of an experiment to investigate the Faraday's Law.

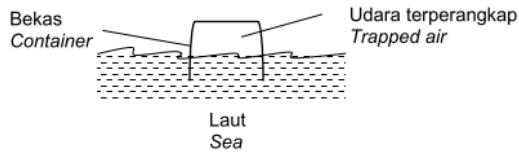
Which of the following statement true about the above experiment?

	Manipulated variable	Constant variable	Responding variable
A	Height of magnet drop into solenoid	Induced current	Number of turns
B	Height of magnet drop into solenoid	Number of turns	Induced current
C	Number of turns	Height of magnet drop into solenoid	Induced current
D	Induced current	Number of turns	Height of magnet drop into solenoid

3. which tool can be used to measure force?

- A. Lever balance
- B. Inertia balance
- C. Spring balance
- D. Electronic balance

4. Diagram show air trapped in an empty container floating in the sea at noon. During night time the volume of trapped air reduced



Which law explains this situation?

- A. Boyle's Law
- B. Charles's Law
- C. Pressure law

5. Johannes Kepler, a German astronomist whom had formulated laws that describe the movement of planets around the Sun which explains

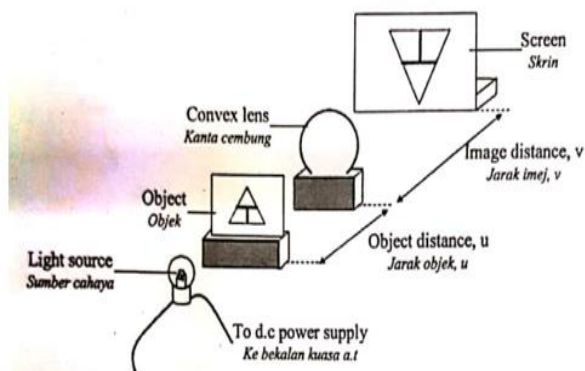
- I. all planets move in elliptical orbits, with the sun at one focus (Law of Orbits).
- II. a line that connects a lanet to the sun sweeps out equal areas in equal times (Law of Areas).
- III. the square of the period of any planet is directly proportional to the square of the radius of its orbit (Law of Periods).

- A. I and II only
- B. I and III only
- C. II and III only

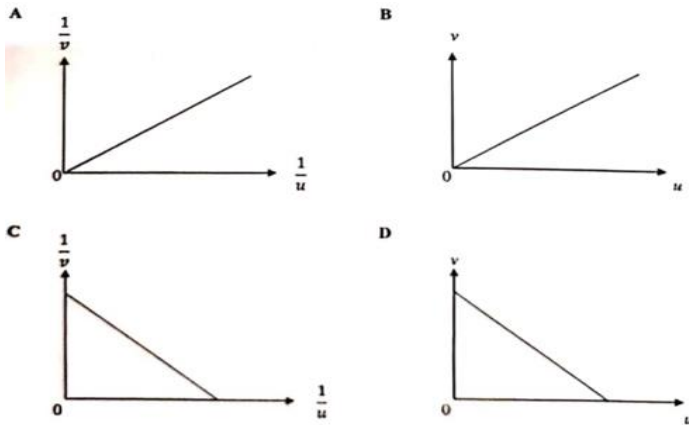
6. Diagram show an arrangement of an experiment to investigate the relationship between object distance,  $u$  and image distance,  $v$ .

Which of the following graph show the correct relationship between  $v$  and  $U$  true?

4 Rajah menunjukkan satu susunan eksperimen untuk menyiasat hubungan antara jarak objek,  $u$  dan jarak imej,  $v$ .



Graf manakah yang menunjukkan hubungan antara  $v$  dan  $u$  yang betul?



**Paper 2 KSSM**

**Structures (60 marks)**

1.

Newton’s Universal Law of Gravitation states that the gravitational force between two bodies is directly proportional to the products of the masses of both bodies and inversely proportional to the square of the distance between the centres of the two bodies,  $F = \frac{Gm_1m_2}{r^2}$ . While according to Newton’s Second Law of Motion, gravitational force,  $F = mg$ .

*Hukum Kegravitian Semesta Newton menyatakan bahawa daya graviti antara dua jasad adalah berkadar terus dengan hasil darab jisim kedua-dua jasad dan berkadar songsang dengan kuasa dua jarak di antara pusat dua jasad tersebut,  $F = \frac{Gm_1m_2}{r^2}$ . Manakala, menurut Hukum Gerakan Newton Kedua, daya gravity,  $F = mg$ .*

(a) What is the relationship between gravitational acceleration with the square of distance between the centres of the two bodies?

*Apakah hubungan antara pecutan graviti dengan kuasa dua jarak di antara pusat dua jasad tersebut?*



[1 mark/ 1

markah]

(b) Complete the following sentence by ticking (/) the correct answer.

*Lengkapkan ayat berikut dengan menandakan (/) jawapan yang betul.*

Centripetal force is the force acts on the body in a direction towards the centre of the circle and the equation for centripetal force is

*Daya memusat ialah daya yang bertindak keatas jasad yang sentiasa menuju ke pusat bulatan dan persamaan untuk daya memusat ialah*

$F = \frac{mv^2}{r}$



$$F = \frac{mv}{r^2}$$

[1 mark/ 1 markah]

(c) based on the equation on (b) above, state the representation of  $v$  and  $r$  if a satellite is orbiting the Earth.

berdasarkan persamaan pada (b) di atas, nyatakan perwakilan untuk  $v$  dan  $r$  jika sebuah satelit mengorbit mengelilingi Bumi.

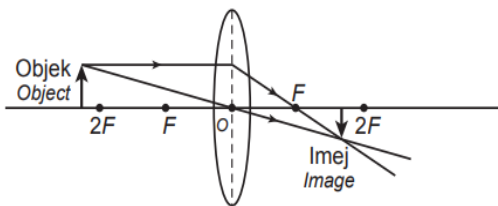


$v =$  \_\_\_\_\_

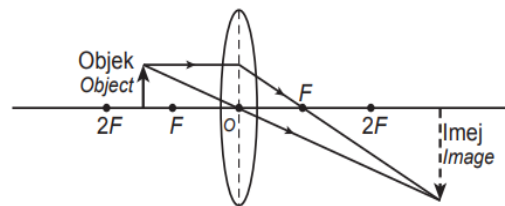
$r =$  \_\_\_\_\_

[2 mark/ 2 markah]

2. Rajah 3.1 dan Rajah 3.2 menunjukkan panjang fokus,  $f$  bagi dua kanta cembung. Kedua-dua kanta cembung itu mempunyai indeks biasan yang sama. *Diagram 6.1 and Diagram 6.2 show two convex lenses. Both convex lenses have the same refractive index.*



Rajah / Diagram 3.1



Rajah / Diagram 3.2

- a. Tandakan ( $\checkmark$ ) pada jawapan yang betul dalam kotak yang disediakan. *Tick ( $\checkmark$ ) the correct answer for the box provided.*

Kanta cembung dikenali sebagai  
*Convex lenses are known as*



kanta penumpu  
*converging lenses*

kanta pencapah  
*diverging lenses*

[1 markah / 1 mark]

Perhatikan Rajah 3.1 dan Rajah 3.2,  
*Observe Diagram 3.1 and Diagram 3.2,*

- i. Bandingkan jarak objek.



Compare the object distance.

.....

[1 markah / 1 mark]



ii. Bandingkan jarak imej.  
Compare the image distance.

.....

[1 markah / 1 mark]



iii. Hubung kaitkan jarak objek dengan jarak imej.  
Relate the object distance with the image distance.

.....

[1 markah / 1 mark]

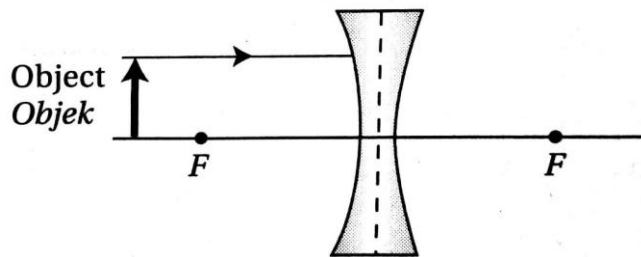


iv. Namakan fenomena cahaya yang berlaku.  
Name the light phenomenon occurred.

.....

[1 markah / 1 mark]

c. Rajah 3.3 menunjukkan gambar rajah sinar yang tidak lengkap.  
Diagram 3.3 shows an incomplete ray diagram.



Rajah / Diagram 3.3

i. Pada Rajah 3.3, lengkapkan gambar rajah sinar untuk menunjukkan bagaimana imej terbentuk.

On Diagram 3.3, complete the ray diagram to show the image is formed.

[ 3 markah / 3 marks ]

ii. Nyatakan ciri-ciri bagi imej yang terbentuk dalam Rajah 3.3.  
State the characteristics of the image formed in Diagram 3.3.

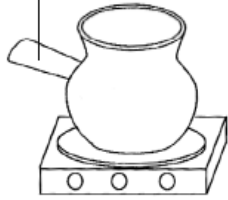
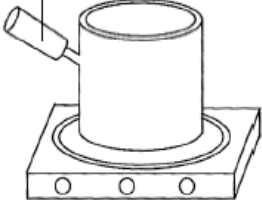


.....

[1 markah / 1 mark]

3. Table 2 shows two types of pot and their characteristics.

*Jadual 2 menunjukkan dua jenis periuk dan ciri-cirinya.*

Type of pot <i>Jenis periuk</i>	Clay pot <i>Periuk tanah liat</i>  Clay handle <i>Pemegang tanah liat</i>   Hot plate <i>Plat pemanas</i>	Copper pot <i>Periuk kuprum</i>  Polymer handle <i>Pemegang polimer</i>   Hot plate <i>Plat pemanas</i>
Specific heat capacity, $c$ <i>Muatan haba tertentu</i>	$900 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ Clay <i>Tanah liat</i>	$390 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ Copper <i>Kuprum</i>
Mass <i>Jisim</i>	3.5 kg	2.5 kg

Jadual /Table 1

(a) Apakah maksud muatan haba tentu?

)

*What is the meaning of specific heat capacity?*

.....



.....

[1

markah / mark]

(b) Berdasarkan Jadual 1, nyatakan ciri-ciri bagi periuk jika digunakan untuk masak sesuatu ciri-ciri itu.

)

*Based on Table 1, state suitable characteristics of the pot if it is to be used for cooking something rapidly.*

Berikan sebab untuk kesesuaian ciri-ciri itu.

*Give reason for the suitability of the characteristic.*

(i) Bahan untuk membuat periuk.



*Material for making the pot.*

.....



[2 markah / mark]

- (ii) Bahan untuk membuat pemegang periuk  
*Material for making the handle of the pot.*



.....

Sebab

*Reason*

.....

[2 markah / mark]

- (c ) Periuk-periuk itu dipnaskan dengan menggunakan plat pemanas elektrik berkuasa 800W.

Berdasarkan maklumat Jadual 1, hitung masa yang diambil untuk meningkatkan suhu sebanyak 90°C bagi:

*The pots are heated by using an electric hot plate of power 800W.*

*Based on the information in Table 1, calculate the time taken to achieve a temperature rise of 90°C for:*

- (i) Periuk tanah liat  
*The clay pot.*

[2 markah / mark]



- (ii) Periuk kuprum  
*The copper pot*



[2 markah / mark]

4.

Diagram 6.1 and Diagram 6.2 show that a current is induced in a solenoid when a bar magnet is moved in or out of the solenoid.

*Rajah 6.1 dan Rajah 6.2 menunjukkan arus diaruhkan dalam sebuah solenoid apabila sebatang magnet bar digerakkan masuk atau keluar dari solenoid itu.*

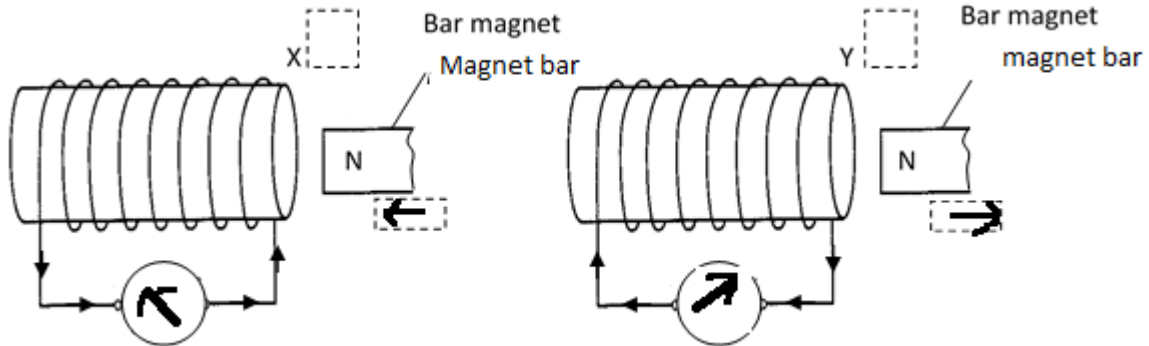


DIAGRAM 6.1 / RAJAH 6.1

DIAGRAM 6.2 / RAJAH 6.2

(a) What is meant by **induced current**?

*Apakah yang dimaksudkan dengan **arus aruhan**?*



.....

[1  
mark]

(b) Based on the direction of the current in Diagram 6.1 and Diagram 6.2;

*Berdasarkan arah arus dalam Rajah 6.1 dan Rajah 6.2;*

(i) Label the polarity at the end of each solenoid in box X and box Y.

*Label kekutuban di hujung setiap solenoid dalam petak X dan petak Y.*



[2 marks]

(ii) Label the direction of motion of the bar magnet in the boxes provided in Diagram 6.1 and Diagram 6.2

*Label arah gerakan setiap magnet bar dalam petak yang disediakan di Rajah 6.1 dan Rajah 6.2.*




[2 marks]

(c) (i) State whether the force that acts between the solenoid and bar magnet in Diagram 6.1 and Diagram 6.2 is attractive or repulsive.

*Nyatakan sama ada daya yang bertindak antara solenoid dan magnet bar dalam Rajah 6.1 dan Rajah 6.2 adalah tarikan atau tolakan.*

Force in Diagram 6.1 / *Daya dalam Rajah*

6.1 : .....  


Force in Diagram 6.2 / *Daya dalam Rajah*

6.2 : ..... [2 marks]

(ii) Name the law that applies to (c)(i).

*Namakan hukum yang digunakan di (c)(i).*



[1 mark]

(d) Suggest **one** method to increase the magnitude of the induced current in the solenoid.

*Cadangkan **satu** kaedah untuk menambahkan magnitud arus aruhan dalam solenoid.*



[1 mark]

**ESSAY Part B**

5



(a) Apakah yang dimaksudkan dengan kerintangan dawai?  
What is meant by resistivity of a conductor?  
[1 mark]

(b) Tentukan fuis yang sesuai bagi cerek bertanda 240V, 800W (Pilihan fuis adalah 1A, 3A, 5A, 8A atau 13A)  
Determine an appropriate fuis for a kettle that is marked 240V, 800W.

( choice of fuis is 1A, 3A, 5A, 8A atau 13A) [ 2 marks].



(c)

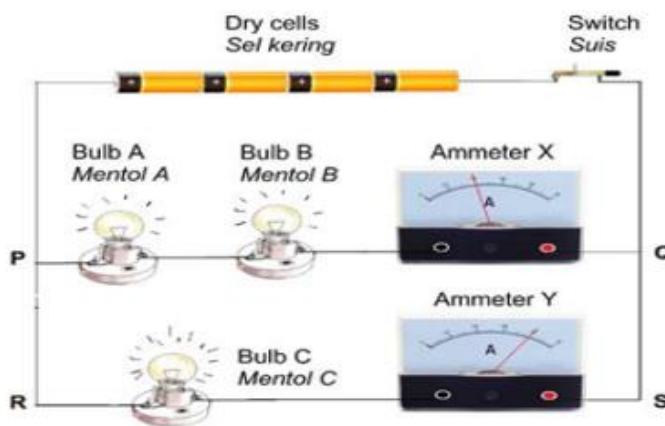


Diagram 10.1  
Rajah 10.1

Diagram 10. 1 shows an electrical circuit consist of three identical bulbs. Two bulbs and an ammeter are placed across PQ. A bulb and an ammeter are placed across RS. Assume the internal resistance of the dry cells is zero.

Rajah 10.1 menunjukkan litar elektrik mengandungi tiga mentol yang serupa. Dua mentol dan ammeter diletakkan merentasi PQ. Satu mentol dan ammeter diletakkan merentasi RS. Anggap rintangan dalam sel kering adalah sifar.



A piece of copper wire is connected across Bulb B in Diagram 10.1.  
Seutas dawai kuprum disambung merentasi Mentol B dalam Rajah 10.1.

Explain what happens to the ammeter readings and brightness of the bulbs.  
Terangkan apakah yang berlaku kepada bacaan ammeter dan kecerahan mentol. [4 marks]

(d)

Table 11.2 shows design of four pressure cookers and their characteristics.

Jadual 11.2 menunjukkan rekabentuk bagi empat periuk tekanan dan cirri-cirinya.

You are required to determine the most suitable specifications for a design of a pressure cooker. Explain the suitability of each specification. Choose the most suitable pressure cooker and give reasons for your choice.

Anda dikehendaki menentukan spesifikasi yang paling sesuai untuk merekabentuk sebuah periuk tekanan. Terangkan kesesuaian setiap spesifikasi. Pilih periuk tekanan yang paling sesuai dan beri sebab untuk pilihan anda.

[10 marks]

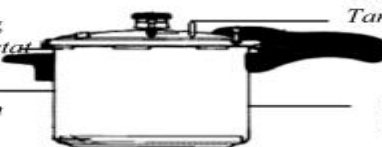


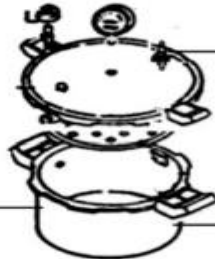


Model Model	Characteristics of the model <i>Ciri-ciri model</i>
P	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>Without sealing ring <i>Tanpa gelung pengetat</i></p> <p>1 layer <i>1 lapisan</i></p> </div> <div style="width: 40%; text-align: center;">  </div> <div style="width: 30%;"> <p>Without release valve <i>Tanpa injap pelepas</i></p> <p>Iron pot <i>Periuk besi</i></p> </div> </div>
Q	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>Steel pot <i>Periuk keluli</i></p> </div> <div style="width: 40%; text-align: center;">  </div> <div style="width: 30%;"> <p>Release valve <i>Injap pelepas</i></p> <p>Sealing ring <i>Gelung pengetat</i></p> <p>Multilayer <i>Banyak lapisan</i></p> </div> </div>
R	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"></div> <div style="width: 40%; text-align: center;">  </div> <div style="width: 30%;"> <p>Without release valve <i>Tanpa injap pelepas</i></p> <p>Sealing ring <i>Gelung pengetat</i></p> <p>one layer iron pot <i>satu lapisan periuk besi</i></p> </div> </div>
S	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>Steel pot <i>Periuk keluli</i></p> </div> <div style="width: 40%; text-align: center;">  </div> <div style="width: 30%;"> <p>Release valve <i>Injap pelepas</i></p> <p>Multilayer <i>Banyak lapisan</i></p> </div> </div>

Table 11.2  
Jadual 11.2

-  (e) Selain daripada spesifikasi periuk tekanan yang diberikan dalam Jadual di atas, cadangkan satu faktor lain bagi periuk tekanan tersebut untuk membolehkan periuk tekanan tersebut digunakan dengan selamat. Beri satu sebab.

-  Apart of the specification of the pressure cooker given in Table above, suggest another one factor for the pressure cooker to enable it to be used safely. Give a reason. [2 marks]

**KBAT QUESTIONS**

6

(d)

Diagram 9.3 shows Hazim is driving a hydrofoil boat in a lake. As the boat moves, the hydrofoil lift the boat's hull out of the water surface due to its foil attached underneath the boat, hence increase the speed of the boat. Explain how hydrofoil lifts the boat to increase its speed.

*Rajah 9.3 menunjukkan Hazim memandu sebuah bot hidrofoil di sebuah tasik. Apabila bot bergerak, hidrofoil mengangkat badan bot keluar dari permukaan air disebabkan oleh penghadang yang dipasang dibawahnya, seterusnya meningkatkan kelajuan bot. Terangkan bagaimana hidrofoil boleh mengangkat bot dan meningkatkan kelajuannya.*

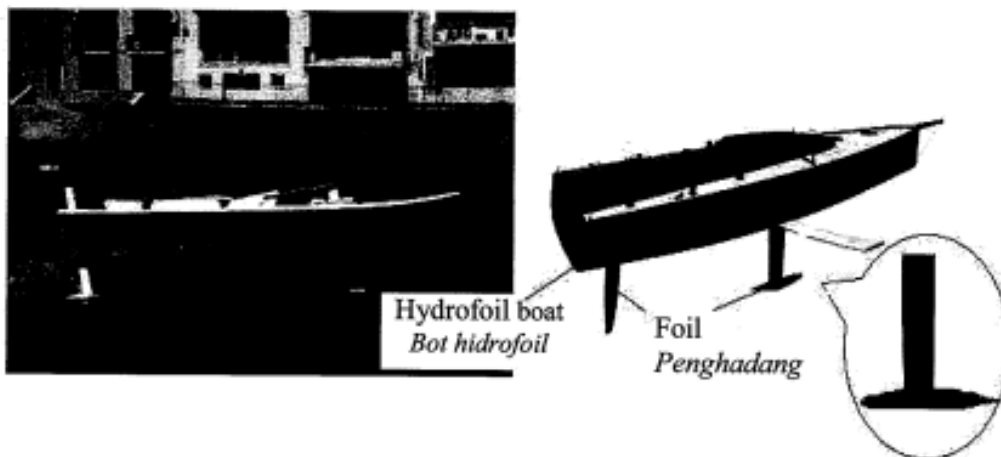


Diagram 9.3  
Rajah 9.3

[4 marks]  
[4 markah]

**Cyberjaya**

- 7) Diagram 10.2 shows a potential difference,  $V$ , against, electric current,  $I$  graph for two electrical components, which are, a filament lamp and a constantan wire conductor.

Rajah 10.2 menunjukkan satu graf beza keupayaan,  $V$ , melawan arus elektrik,  $I$ , bagi dua komponen elektrik, iaitu, lampu filamen dan konduktor wayar konstantan.

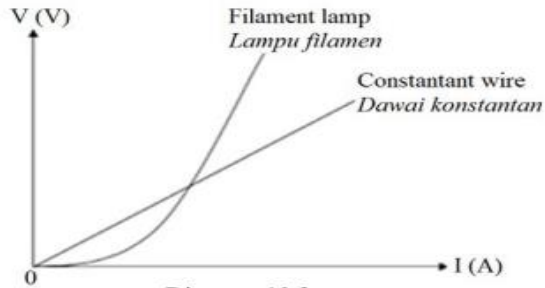


Diagram 10.2  
Rajah 10.2



Based on Diagram 10.2, compare the shape of the graphs, the gradient of the graphs and the resistance of the filament lamp and the constantan wire conductor. Relate the shape of the graph and the resistance of the electrical components to make a deduction on which of the conductor is an Ohmic conductor. [5 marks]



8 a) Diagram 10.3 shows a filament lamp in an electrical wiring system in a house

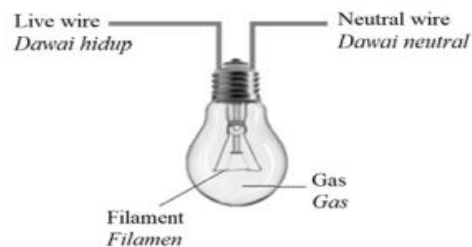


Diagram 10.3

Rajah 10.3 menunjukkan sebuah lampu filamen dalam sistem pendawaian elektrik di sebuah rumah.



It is observed that the filament lamp produces a dim light. As an electrical engineer at Power System Consulting, suggest modifications that can be made to the structure of the filament lamp in Diagram 10.3, so that it can produce a brighter light. State and explain the modifications based on the characteristics of the coil and the characteristics of the gas filled in the filament bulb.

Lampu filamen tersebut didapati menghasilkan cahaya yang malap. Sebagai jurutera elektrik di Power System Consulting, cadangkan pengubahsuaian yang boleh dibuat kepada struktur lampu filamen dalam Rajah 10.3, supaya ia boleh menghasilkan cahaya yang lebih cerah. Nyatakan dan terangkan pengubahsuaian berdasarkan ciri-ciri gegelung dan ciri-ciri gas yang diisi dalam mentol filamen tersebut.

[10 marks]

## Paper 3

### Senarai semak Calon

#### Candidate's Check List

##### **Arahan**

Anda tidak dibenar mengendalikan radas bagi lima minit pertama. Tempoh ini hendaklah digunakan untuk menyemak senarai radas, membaca soalan dan merancang eksperimen yang akan dijalankan. Tandakan (/) pada ruangan kotak disediakan untuk menyemak bahan dan radas yang disediakan dan dibekalkan.

##### ***INSTRUCTION***

*You are not allowed to work with apparatus in first five minutes. This period is used to check the apparatus list, read the question and plan the experiment which is carried out. Mark (/) in the box provided to check the material and apparatus prepared and supplied.*

Bil. Number	Radas/ Bahan Apparatus/ Materials	Kuantiti Quantity	Ya (/)/ Tidak (x) Yes (/)/ No (x)
1	Kanta cembung/ <i>convex lense f=10cm</i>	1	
2.	Lilin/ <i>candle</i>	1	
3.	Skrin putih/ <i>white screen</i>	1	
4.	Pembaris ½ meter/ <i>Meter rule ½ meter</i>	1	
5.	Pemegang Kanta/ <i>Lens holder</i>	1	

Jadual 3/ *Table 3*

##### Soalan

1. Rajah 3.1 menunjukkan sebuah papan tanda sekolah diperhatikan melalui suatu kanta cembung.

Rajah 3.2 menunjukkan papan tanda itu diperhatikan melalui kanta cembung yang sama apabila

kanta itu dibawa lebih dekat kepada papan tanda itu.

*Diagram 3.1 shows a school sign is viewed through a convex lens.*

*Diagram 3.2 shows the sign is viewed with the same convex lens when the lens is closer to the sign.*





Diagram 3.1  
Rajah 3.1



Diagram 3.2  
Rajah 3.2

(a) Berdasarkan situasi di atas, rancangkan eksperimen ini dengan menggunakan radas dan bahan yang diberikan dalam Jadual 3.

Prosedur anda hendaklah mengandungi:

- Cara mengendalikan pemboleh ubah.
- Langkah berjaga-jaga.

*Based on the situation above, plan your experiment by using the apparatus and materials provided in Table.*

*Your procedure should include:*

- *Method to handle variables.*
- *Step of precaution..*



[4 markah/  
marks]

(b) Nyatakan pemboleh ubah bagi eksperimen ini:

*State the variables of this experiment:*

(i) pemboleh ubah dimanipulasikan

*manipulated variable*

[1 markah/ mark]

---

(ii) pemboleh ubah bergerak balas

*responding variable*

[1 markah/ mark]

---

(c) Jalankan eksperimen tersebut, dan buat penjadualan data.

*Carry out the experiment and tabulate the data.*

[3 markah/ marks]

(d) Pada kertas graf yang disediakan, plotkan graf berdasarkan penjadualan data dalam 3(b).

*On the graph paper provided, plot a graph based on the tabulation data in (b)*

[3 markah/ marks]

(e)

Berdasarkan graf anda di 3 (d), nyatakan nilai pintasan graph yang diplotkan.

*Based on your graph in 3(d), state the intercept value of the plotted graph*

[1 markah/ mark]

(f) Tentukan nilai  $f$ , panjang fokus dan kuasa kanta tersebut.

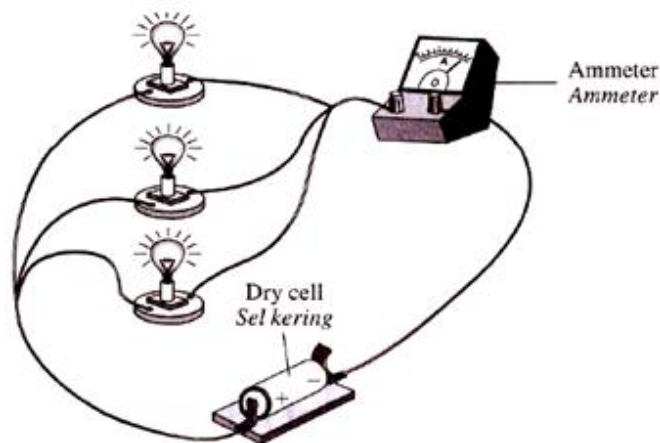
*Calculate the value of  $f$ , focal length and power of the lense.*

[2 markah/ marks]

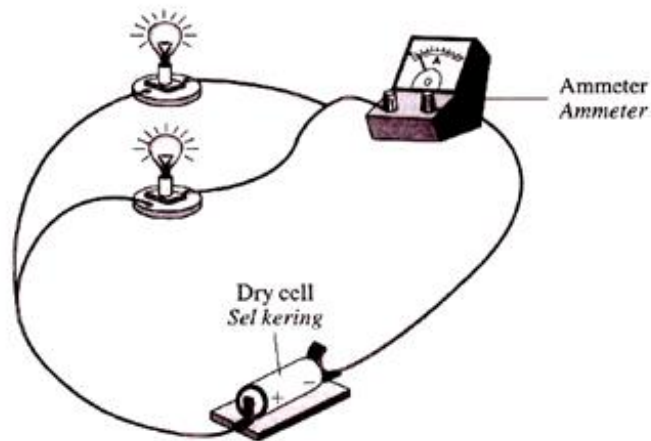
**BAHAGIAN C**  
**SECTION C**

1. Rajah 1.1 dan Rajah 1.2 menunjukkan dua litar elektrik. Ammeter, sel kering dan mentol adalah serupa dalam kedua-dua rajah. Anggap rintangan dalam sel kering adalah sifar.

*Diagram 1.1 and Diagram 1.2 show two electrical circuits. The ammeters, dry cells and bulbs are identical in both diagrams. Assume the internal resistance of the dry cell is zero.*



Rajah / Diagram 1.1



Rajah / Diagram 1.2

- (a) Apakah maksud rintangan?  
*What is the meaning of resistance?*



[1 markah / mark]

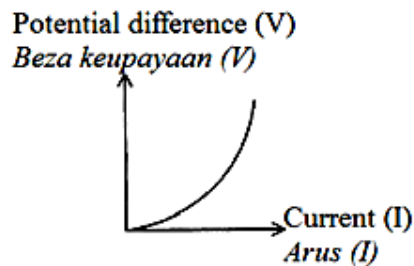
- (b) Dengan menggunakan Rajah 1.1 dan Rajah 1.2, bandingkan bilangan mentol, bacaan ammeter dan rintangan berkesan. Hubungkan bilangan mentol disusun secara selari dengan bacaan ammeter untuk membuat satu deduksi yang menghubungkan hubungan antara bilangan mentol yang disusun secara selari dan rintangan berkesan.

*Using Diagram 1.1 and Diagram 1.2, compare the number bulbs, the readings of ammeters and the effective resistance. Relate the number of bulbs arrange in parallel with the reading of ammeters to make deduction regarding relationship between the number of bulbs arrange in parallel and the effective resistance.*

[5 markah / marks]

- (c) Rajah 1.3 menunjukkan graf beza keupayaan,  $V$  melawan arus,  $I$  untuk mentol filament.

*Diagram 1.3 shows a graph of potential difference,  $V$ , against current,  $I$ , for a filament lamp.*



Rajah / Diagram 1.3

- i) Berdasarkan graf pada Rajah 1.3, nyatakan satu hubungan antara  $V$  dan  $I$ . Apakah kesimpulan yang dapat anda buat tentang rintangan lampu tersebut? Beri **satu** sebab bagi jawapan anda.

*Based on the graph in Diagram 1.3, state a relationship between  $V$  and  $I$ .*

*What can you conclude about the resistance of the lamp?*

*Give **one** reason for your answer.*

[3 markah / marks]

- ii) Apakah yang berlaku kepada tenaga yang dilesapkan di dalam lampu filamen itu apabila arus yang mengalir dinaikkan?

*What happens to the energy dissipated in the filament lamp when the current flowing is increased?*

[1 markah / mark]

- (d) Rajah 1.4 menunjukkan pelbagai jenis kabel penyambung  
*Diagram 1.4 shows variety of connecting cords.*



Rajah / *Diagram 1.4*

Sebagai seorang jurutera elektrik, anda diminta untuk menentukan jenis wayar yang sesuai digunakan sebagai kabel penyambung yang digunakan oleh alat elektrik di rumah.

Dengan menggunakan pengetahuan fizik, terangkan cadangan anda berdasarkan ciri-ciri wayar, takat lebur, kadar pengaratan serta lain-lain aspek yang berkaitan.  
*As an electrical engineer, you are required to determine the type of wire that is suitable to be used as connecting cord for electric devices in a house.*

*Using your physics knowledge, explain your suggestions according to the characteristics of wire, melting point, rate of rusting and other related aspects.*



[10 markah / *marks*]