SP025/2
Physics 2
Paper 2
Semester II
Session 2018/2019
2½ hours

SP025/2
Fizik 2
Kertas 2
Semester II
Sesi 2018/2019
2½ jam

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN MATRIKULASI
MATRICULATION DIVISION

PEPERIKSAAN SEMESTER PROGRAM MATRIKULASI
MATRICULATION PROGRAMME EXAMINATION

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

Kertas soalan ini mengandungi **18** halaman bercetak.
This question paper consists of **18** *printed pages.*

Answer **all** questions.
*Jawab **semua** soalan.*

1

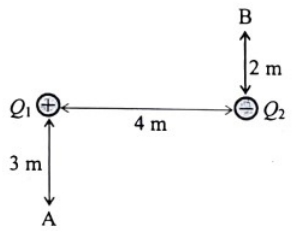

FIGURE 1
RAJAH 1

FIGURE 1 shows two charges, $Q_1 = +8\ \mu C$ and $Q_2 = -6\ \mu C$ placed 4 m apart.
RAJAH 1 *menunjukkan dua cas,* $Q_1 = +8\ \mu C$ *dan* $Q_2 = -6\ \mu C$ *terpisah* 4 m.

(a) Calculate the electric potential at points A and B.
Hitung keupayaan elektrik pada titik A *dan* B.

[4 *marks*]
[4 *markah*]

(b) Calculate electric potential difference between points A and B.
Hitung beza keupayaan elektrik di antara titik A *dan* B.

[1 *mark*]
[1 *markah*]

(c) Determine the electric field at point A.
Tentukan medan elektrik di titik A.

[8 *marks*]
[8 *markah*]

2

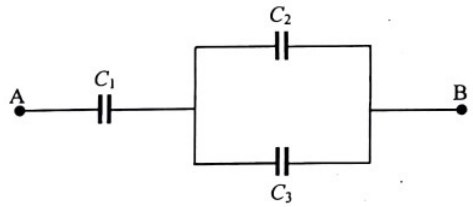

FIGURE 2
RAJAH 2

FIGURE 2 shows three capacitors C_1, C_2 and C_3, each 12 μF connected between points A and B.
RAJAH 2 *menunjukkan tiga kapasitor* C_1, C_2 *dan* C_3, *setiap satu* 12 μF *disambung di antara titik* A *dan* B.

(a) Calculate the effective capacitance.
Hitung kapasitan berkesan.

[3 *marks*]
[3 *markah*]

(b) If the potential difference across AB is 9 V, calculate the stored energy.
Jika beza keupayaan merentasi AB *ialah* 9 V, *hitung tenaga tersimpan.*

[1 *mark*]
[1 *markah*]

3 (a) Calculate the number of electrons that flow in a wire if it carries a current of 2 A for 5 s.

Hitung bilangan elektron yang mengalir dalam dawai jika ia membawa arus 2 A *dalam* 5 s.

[3 *marks*]
[3 *markah*]

(b) A 2.5 kW heater is connected to a 220 V power supply.

Satu pemanas 2.5 kW *disambung pada bekalan kuasa* 220 V.

(i) Calculate the current and resistance in the heater.

Hitung arus dan rintangan pemanas.

(ii) The coil of heater is made from a wire of cross-sectional area 2×10^{-7} m^2 and resistivity 1.1×10^{-6} Ω m. Calculate the length of the wire.

Gegelung pemanas itu dibuat daripada dawai berkeratan rentas 2×10^{-7} m^2 *dan kerintangan* 1.1×10^{-6} Ω m. *Hitung panjang dawai.*

(iii) The voltage of the power supply is then changed to 110 V. Calculate the new power output of the heater.

Voltan bekalan kuasa itu kemudian diubah kepada 110 V. *Hitung output kuasa baharu pemanas itu.*

[7 *marks*]
[7 *markah*]

(c)

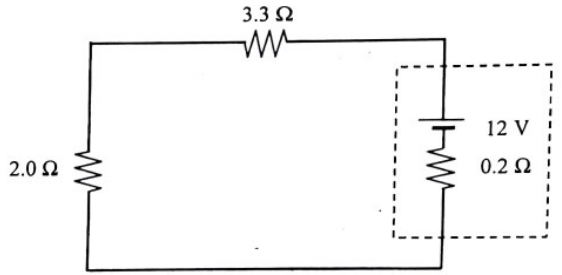

FIGURE 3
***RAJAH* 3**

FIGURE 3 shows a circuit with a battery having an emf of 12 V and an internal resistance of 0.2 Ω connected in series to two resistors, 3.3 Ω and 2.0 Ω.

***RAJAH* 3** *menunjukkan satu litar mengandungi satu bateri dengan* dge 12 V *dan rintangan dalamnya* 0.2 Ω *bersambung sesiri dengan dua perintang,* 3.3 Ω *dan* 2.0 Ω.

(i) Calculate the current in the circuit.

Hitung arus dalam litar.

(ii) Calculate the terminal voltage across the battery.

Hitung voltan terminal merentasi bateri tersebut.

[5 *marks*]
[5 *markah*]

4 (a)

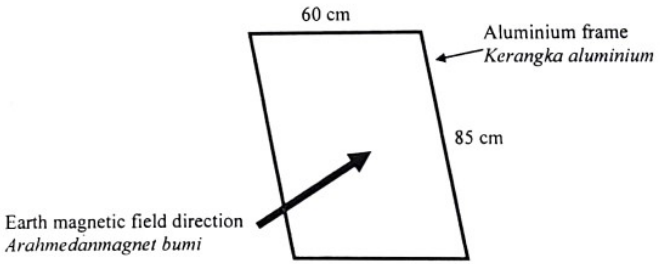

FIGURE 4.1
***RAJAH* 4.1**

FIGURE 4.1 shows the Earth's magnetic field of 1.8×10^{-4} T normal to an aluminium frame of dimensions 60 cm × 85 cm.

***RAJAH* 4.1** *menunjukkan medan magnet bumi* 1.8×10^{-4} T *serenjang kepada kerangka aluminium berdimensi* 60 cm × 85 cm.

(i) Calculate the magnetic flux through the frame.

Hitung fluks magnet melalui kerangka.

(ii) The frame is flipped so that it is parallel to the Earth magnetic field in 0.2 s. Calculate the induced emf.

Kerangka itu dipusing sehingga ia selari dengan medan magnet bumi dalam 0.2 s. *Hitung* dge *teraruh.*

[6 *marks*]
[6 *markah*]

(b)

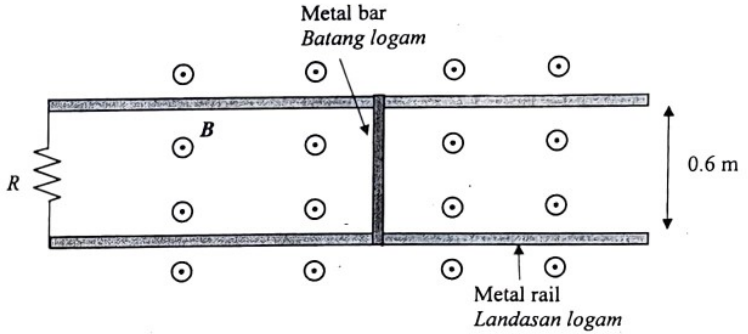

FIGURE 4.2
***RAJAH* 4.2**

FIGURE 4.2 shows a 0.6 m long metal bar being pulled to the right at a steady speed of 5.7 m s^{-1} perpendicular to a uniform 0.7 T magnetic field. The metal rails are connected to a 5 Ω resistor.

***RAJAH* 4.2** *menunjukkan satu batang logam sepanjang* 0.6 m *ditarik ke kanan dengan laju malar* 5.7 m s^{-1} *serenjang dengan medan magnet seragam* 0.7 T. *Landasan-landasan logam disambung kepada perintang* 5 Ω.

(i) Calculate the magnitude of the emf induced in the circuit.

Hitung magnitud dge *teraruh dalam litar.*

(ii) Calculate the current through the resistor and its direction in the metal bar.

Hitung arus melalui perintang dan arahnya dalam batang logam.

[4 *marks*]
[4 *markah*]

(c) A solenoid of length 8×10^{-2} m and cross sectional area 5×10^{-5} m^{-2} contains 6500 turns per meter length. Calculate the self-inductance of the solenoid.

Satu solenoid sepanjang 8×10^{-2} m *dan luas keratan rentas* 5×10^{-5} m^{-2} *mengandungi* 6500 *lilitan per meter. Hitung swainduktans solenoid.*

[3 *marks*]
[3 *markah*]

5 (a)

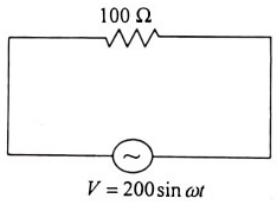

FIGURE 5
RAJAH 5

FIGURE 5 shows an AC source with a voltage of $V = 200\sin \omega t$ connected to a 100 Ω resistor. Calculate the

RAJAH 5 *memaparkan sumber* AU *dengan voltan* $V = 200\sin \omega t$ *disambung pada perintang* 100 Ω. *Hitung*

(i) rms voltage.
voltan pmkd.

(ii) rms current in the resistor.
arus pmkd *dalam perintang.*

(iii) average power delivered to the circuit.
kuasa purata dibekalkan pada litar.

[5 *marks*]
[5 *markah*]

(b) A series RLC circuit consisting of 35 mH inductor, 45 μF capacitor and 85 Ω resistor is connected to an AC generator of 150 V, 60 Hz. Calculate the

Satu litar RLC *sesiri mengandungi induktor* 35 mH, *kapasitor* 45 μF *dan perintang* 85 Ω *disambung kepada penjana* AU 150 V, 60 Hz. *Hitung*

(i) capacitive reactance.
reaktans kapasitif.

(ii) inductive reactance.
reaktans induktif.

(iii) impedance.
impedans.

(iv) phase angle.
sudut fasa.

[8 *marks*]
[8 *markah*]

6 (a) An external side mirror of a car is convex with a radius of curvature 18 m. Determine the location of the image for an object 10 m from the mirror.

Satu cermin sisi luar kereta adalah cembung dengan jejari kelengkungan 18 m. *Tentukan lokasi imej suatu objek* 10 m *dari cermin tersebut.*

[3 *marks*]
[3 *markah*]

(b)

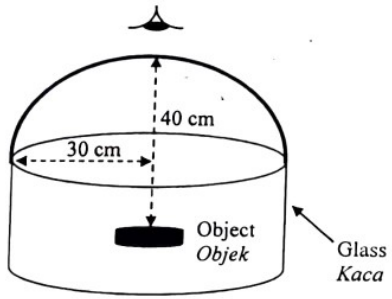

FIGURE 6
RAJAH 6

FIGURE 6 shows an object embedded in a solid glass with a hemispherical end of radius 30 cm and refractive index 1.50. The object is 40 cm inside the glass. Calculate the image distance. Refractive index of air is 1.

RAJAH 6 *menunjukkan satu objek terbenam dalam kaca pejal dengan hujung hemisfera berjejari* 30 cm *dan indeks biasan* 1.50. *Objek itu terletak* 40 cm *dalam kaca. Hitung jarak imej. Indeks biasan udara ialah* 1.

[2 *marks*]
[2 *markah*]

(c) A 2 cm height object is placed 7 cm from a concave mirror whose radius of curvature is 12 cm. Determine the

Satu objek setinggi 2 cm *diletakkan* 7 cm *dari satu cermin cekung berjejari kelengkungan* 12 cm. *Tentukan*

(i) image distance.
jarak imej.

(ii) image height.
ketinggian imej.

(iii) **two (2)** characteristics of the image.
***dua* (2)** *ciri imej.*

[7 *marks*]
[7 *markah*]

7 (a) Orange light of wavelength 600 nm is incident normal to a diffraction grating having 3500 lines per cm.

Cahaya jingga dengan panjang gelombang 600 nm *dituju serenjang pada parut belauan dengan* 3500 *garis* per cm.

(i) Calculate the slit separation.

Hitung jarak pisah celah.

(ii) Determine the maximum number of bright fringes that can be observed.

Tentukan bilangan maksimum pinggir terang yang boleh dicerap.

(iii) How can the number of bright fringes be increased?

Bagaimanakah bilangan pinggir terang boleh ditambah?

[5 *marks*]
[5 *markah*]

(b)

FIGURE 7
***RAJAH* 7**

FIGURE 7 shows two paths of coherent lights from points A and B that produce an interference pattern at point C. Determine whether it is a constructive or destructive interference if AC and BC are 2.2λ and 5.7λ respectively.

***RAJAH* 7** *menunjukkan dua lintasan cahaya koheren dari titik* A *dan* B *yang menghasilkan corak interferens di titik* C. *Tentukan sama ada ia interferens membina atau membinasa jika* AC *dan* BC *masing-masing ialah* 2.2λ *dan* 5.7λ.

[3 *marks*]
[3 *markah*]

(c) Calculate the thickness of a soap film so that a 600 nm light incident to the film would produce constructive interference. Index of refraction of soap film is 1.33.

Hitung tebal saput sabun supaya cahaya tuju 600 nm *kepada saput itu menghasilkan interferens membina. Indeks biasan saput sabun ialah* 1.33.

[4 *marks*]
[4 *markah*]

8 In a photoelectric effect experiment, light of frequency 1.15×10^{15} Hz strikes a metal surface and electrons are emitted immediately. The work function of the metal is 2.3 eV. Calculate the

Dalam satu uji kaji kesan fotoelektrik, cahaya dengan frekuensi 1.15×10^{15} Hz *menghentam satu permukaan logam lalu elektron terpancar serta-merta. Fungsi kerja logam tersebut ialah* 2.3 eV. *Hitung*

(a) threshold frequency of the metal.

frekuensi ambang logam.

[2 *marks*]
[2 *markah*]

(b) maximum kinetic energy of the photoelectrons.

tenaga kinetik maksimum fotoelektron.

[2 *marks*]
[2 *markah*]

(c) stopping potential of the photoelectrons.

keupayaan penghenti fotoelektron.

[2 *marks*]
[2 *markah*]

9 (a) Calculate the speed of a neutron with de Broglie wavelength 9×10^{-11} m.

Hitung laju satu neutron dengan panjang gelombang de Broglie 9×10^{-11} m.

[2 *marks*]
[2 *markah*]

(b) Calculate the wavelength of an electron that has been accelerated across a potential difference of 100 V.

Hitung panjang gelombang elektron yang dipecutkan merentasi beza keupayaan 100 V.

[2 *marks*]
[2 *markah*]

10 (a) A nuclear reaction can be written as:
Satu tindak balas nuklear ditulis sebagai:

$$^{14}_{7}N + {}^{2}_{1}H \rightarrow {}^{12}_{6}C + {}^{4}_{2}He$$

Calculate the energy released (MeV) in the reaction. Given,
Hitung tenaga terbebas (MeV) *dalam tindak balas ini. Diberi,*

Nuclide *Nuklid*	Mass *Jisim*
$^{14}_{7}N$	14.00307 u
$^{12}_{6}C$	12.0000 u
$^{4}_{2}He$	4.00260 u
$^{2}_{1}H$	2.01410 u

[4 *marks*]
[4 *markah*]

(b) A 2 g sample of radioactive iodine $^{131}_{53}I$ has a half-life of 8 days.
Separuh hayat 2 g *sampel radioaktif iodin* $^{131}_{53}I$ *ialah* 8 *hari.*

(i) Calculate the decay constant.
Hitung pemalar reputan.

(ii) Calculate the initial number of atoms in the 2 g sample.
Hitung bilangan atom awal dalam 2 g *sampel ini.*

(iii) Calculate the activity of the sample after 2 days.
Hitung aktiviti sampel selepas 2 *hari.*

[4 *marks*]
[4 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT