امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة) الدور الأول مع نموذج الإجابة

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سلطنة عمان
وزارة التربية والتعليم

مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

الفصل الدراسي الأول - الدور الأول

للعام الدراسي ١٤٤٧/١٤٤٦ هـ - ٢٠٢٤ / ٢٠٢٥ م

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١٥) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ■ **غير صحيح** ▭ ◉ ◒ ☒ ☑

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Items (14 marks)

There are 14 multiple choice items worth one mark each.
Shade in the bubble (○) next to the **best** answer for each item.

1) "The rate of flow of charge carriers" is the definition of:

○ Power. ○ Current.

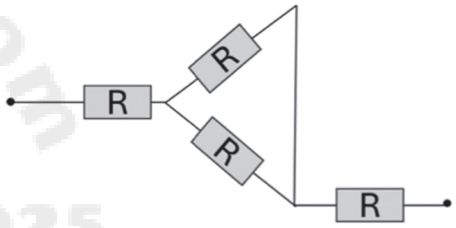
○ Drift velocity. ○ Potential difference.

2) What is the **SI** unit of resistance?

○ Jule. ○ Volt.

○ Ohm. ○ Ampere.

3) What is the combined (total) resistance of the circuit opposite?



○ 0.5R ○ 1.5R

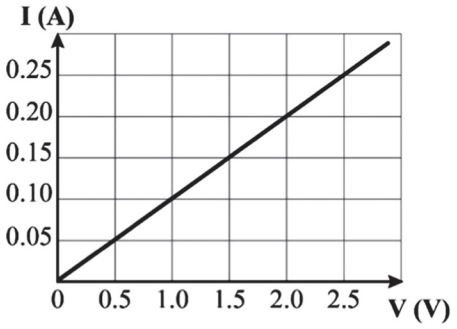
○ 2.5R ○ 4R

4) A copper wire of (2×10^{-6} m^2) cross-sectional area has a charge number density of (8.5×10^{28} m^{-3}). If the average drift velocity of the electrons flowing through the wire is (3.7×10^{-6} m/s), what is the electric current passing through the wire?

○ 0.01 A ○ 0.1 A

○ 1.0 A ○ 1.1 A

5) The graph opposite shows the variation of the electric current (I) versus the potential difference (V) across a resistor (R). What is the value of the resistance (R)?

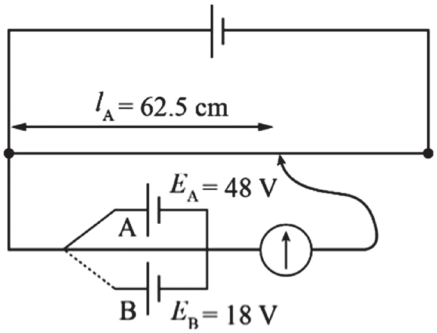


○ 0.05 Ω ○ 0.1 Ω

○ 5.0 Ω ○ 10 Ω

Question 1 continued

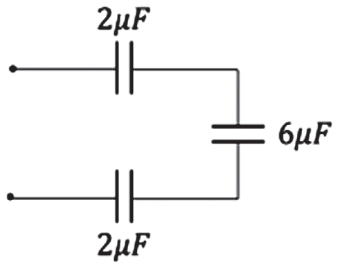
6) The figure opposite shows a potentiometer circuit. What is the length of (l_B)?



- ☐ 18.0 cm
- ☐ 23.4 cm
- ☐ 62.5 cm
- ☐ 76.6 cm

7) Which of the following combinations has the highest combined (total) capacitance?

☐



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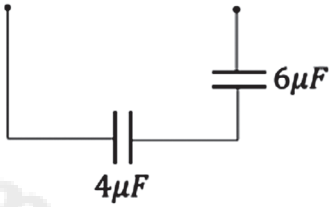

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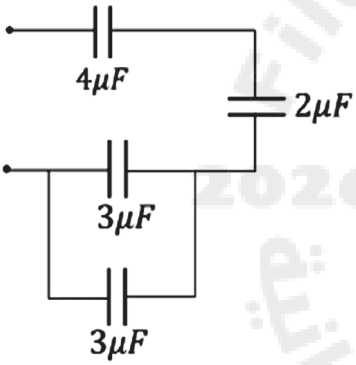

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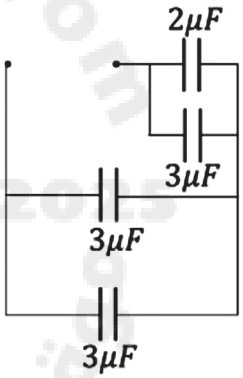

8) Which of the following statements **is correct** about the magnetic field around a bar magnet?

- ☐ The magnetic flux density is constant.
- ☐ The magnetic poles always occur in pairs.
- ☐ The direction of the magnetic field is from the south pole to the north pole.
- ☐ The more closely packed the lines of the magnetic flux, the weaker the field.

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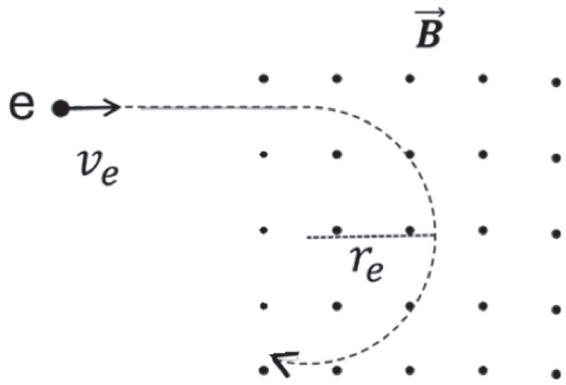
Question 1 continued

9) The figure below shows an electron that enters a uniform magnetic field.

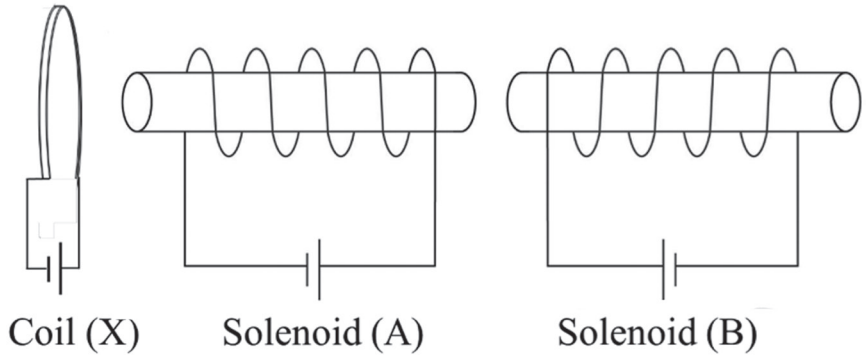


If ($\frac{r_e}{v_e}$ = 2.3 × 10^{-7}s), what is the value of the magnetic flux density (B)?

- ☐ 1.3 × 10^{-18} T
- ☐ 2.5 × 10^{-5} T
- ☐ 3.4 × 10^{-4} T
- ☐ 4.0 × 10^{-4} T

Question 1 continued

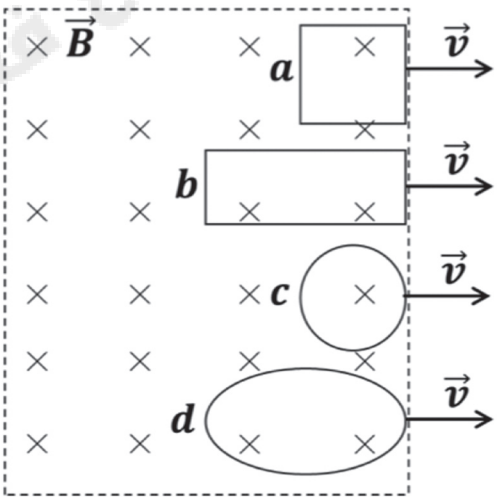
10) A solenoid (A) is placed between a coil (X) and a solenoid (B), as shown in the figure below.



Which of the following **is correct** about the interaction forces between:

	Coil (X) and Solenoid (A)	Solenoid (A) and Solenoid (B)
☐	Repulsion	Repulsion
☐	Repulsion	Attraction
☐	Attraction	Repulsion
☐	Attraction	Attraction

11) The figure opposite shows four loops (**a**, **b**, **c** and **d**) moving out of a uniform magnetic field. In which loops does the rate of change in the magnetic flux remain constant?



- ☐ All of the loops.
- ☐ **c** and **d** loops.
- ☐ **a** and **b** loops.
- ☐ **b**, **c** and **d** loops.

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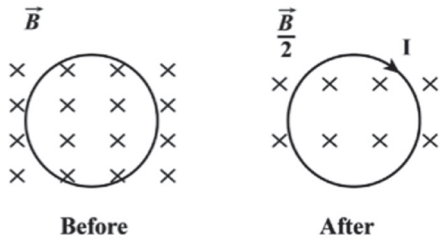
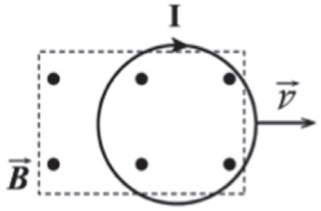
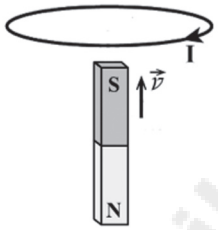
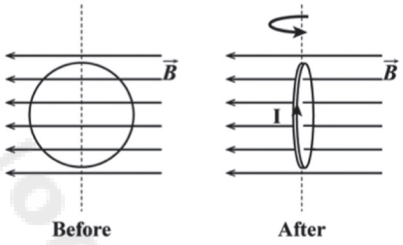
Question 1 continued

12) Which of the following figures shows **the correct** direction of the induced current (I) in a circular flat coil?.

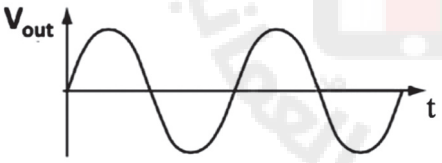


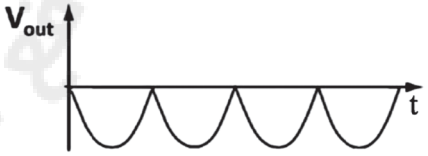


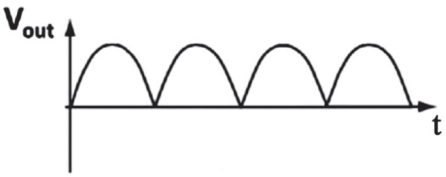


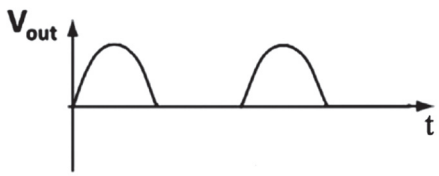


13) Which of the following graphs represents the output voltage versus time for a half-wave rectification?



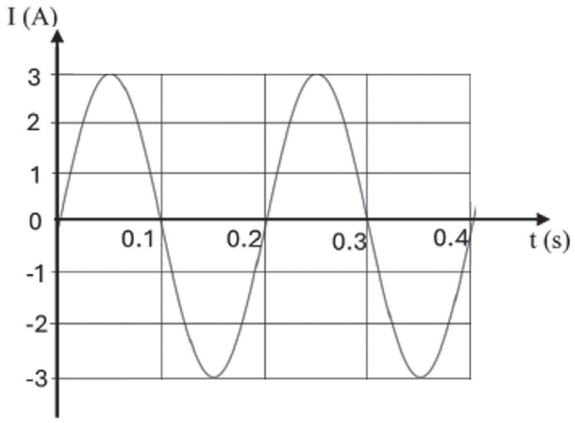






Question 1 continued

14) The graph opposite shows the variation of the current (I) with time (t).



What is the ($I_{r.m.s}$) value?

- ☐ 1.5 A
- ☐ 2.1 A
- ☐ 3.0 A
- ☐ 4.2 A

Question 2: Extended Questions (56 marks)

Write your answer for each of the following questions in the space provided.

Be sure to show all your work, including the correct units where applicable.

15) Write **three factors** that affect the resistance for a metallic wire. (3 marks)

1. _____

2. _____

3. _____

16) State the following:

a. Ohm's law. (1 mark)

_____

_____

_____

b. Kirchoff's first law. (1 mark)

_____

_____

_____

17) Write the **two ways** of connecting diodes in electrical circuits. (2 marks)

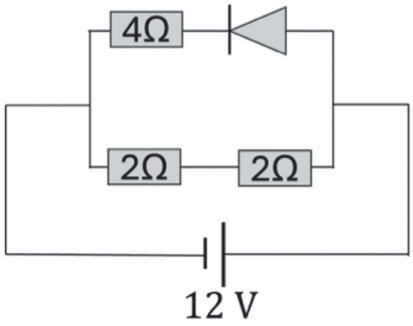
1. _____

2. _____

Question 2 continued

18) The figure opposite shows an electric circuit.

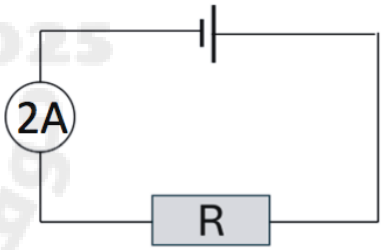
Calculate the following:



a. The combined (total) resistance (R). (2 marks)

b. The total current (I). (2 marks)

19) The figure opposite shows an electric circuit.



a. Calculate the number of electrons flowing through the wire in (2×10^{-3} s). (3 marks)

b. To reduce the number of electrons flowing through the cross-section over the given duration, how should an additional resistor be connected?

☐ Series. ☐ Parallel.

(Choose the correct answer)

Explain your answer. (1 mark)

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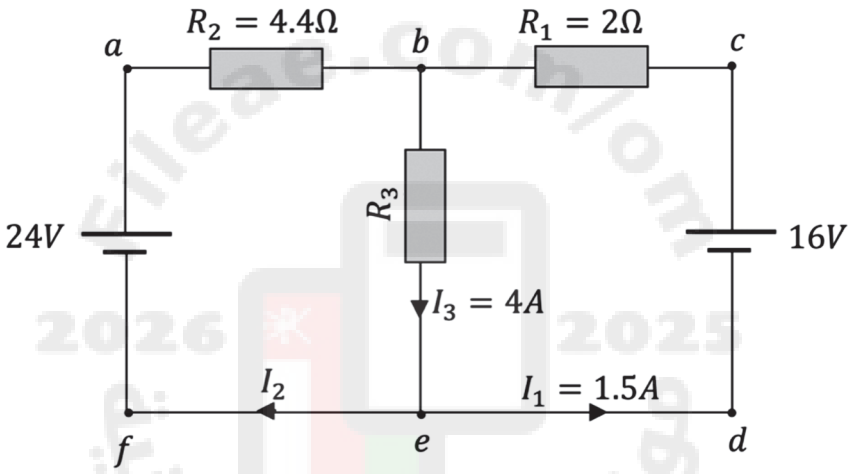
Question 2 continued

20) A copper wire is (0.7 m) long and has a resistance of ($7 \times 10^{-3}\ \Omega$). Calculate the radius (r) of the wire if the resistivity of copper is ($\rho_{copper} = 1.72 \times 10^{-8}\ \Omega.\ m$). (3 marks)

21) The figure below shows an electric circuit.

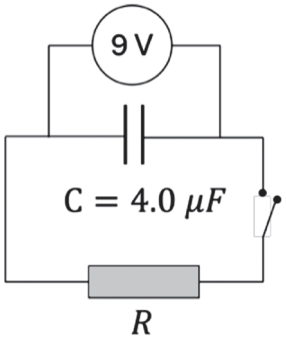


Calculate the following:

a. The current (I_2) (1 mark)

b. The resistance (R_3) (3 marks)

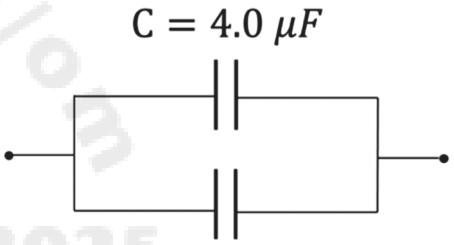
Question 2 continued



22) The figure opposite shows the discharging process of a fully charged capacitor (C) with an initial charge (Q_o).

a) How many time constants does it take for (Q_o) to decrease to (4.87 μC) after closing the switch? (3 marks)

b) If the fully charged capacitor (C) is connected in parallel to an uncharged identical capacitor as shown in the figure opposite.



What will be the charge of (C)?

☐ Q_o ☐ $\frac{Q_o}{2}$

(Choose the correct answer)

Explain your answer. (1 mark)

c) Write **one use** of a capacitor in an electric circuit. (1 mark)

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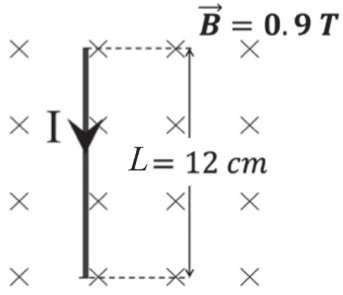
Question 2 continued



23) The figure opposite shows a current-carrying wire placed in a uniform magnetic field. The force on the wire due to the field is (0.6 N).

a) Calculate the current passing through the wire.

(2 marks)

b) Write **four factors** that affect the magnetic force on a current carrying conductor.

(4 marks)

1. _____

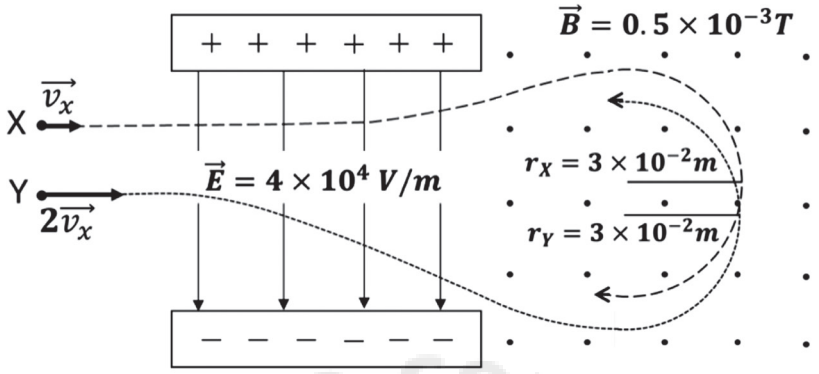
2. _____

3. _____

4. _____

Question 2 continued

24) Two charged particles (X) and (Y) with the same mass of (5.0×10^{-28} kg) enter an electric field (E) experience electric forces of (F_{E_X} =3.2×10^{-14}N) and (F_{E_Y} = 6.4×10^{-14}N), respectively. Then the particles enter a uniform magnetic field (B) and move as shown in the figure below.



a) Calculate the charge of particle (X). (2 marks)

b) Calculate the velocity of particle (X) in the magnetic field. (2 marks)

c) Find the ratio $\frac{F_{B_X}}{F_{B_Y}}$ of particles (X) and (Y) **in the magnetic field**. (2 marks)

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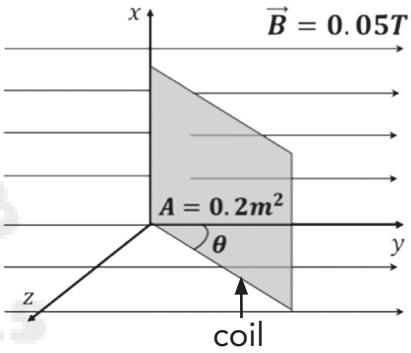
Question 2 continued

25) Complete the table below. (2 marks)

Quantity	Definition
Magnetic flux	_____
_____	The total magnetic flux passing through N turns of a coil.

26) A coil is placed in a uniform magnetic field as shown in the figure opposite. What is the change in the magnetic flux through the coil if the angle (θ) changes from (30° to 55°)? (3 marks)



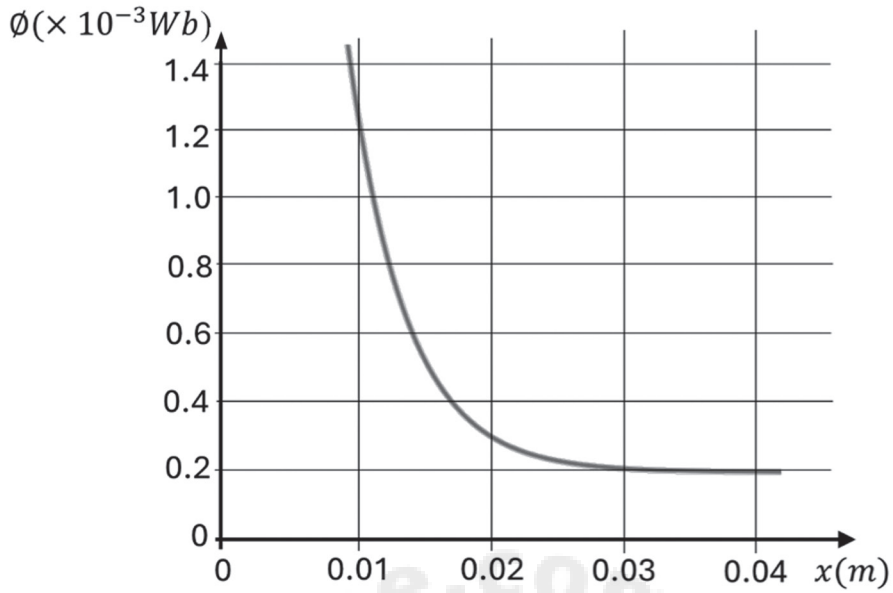
_____

_____

_____

_____

27) The graph below shows the variation of the magnetic flux (ø) of a circular wire loop as it moves away from a bar magnet.



If the loop moves from a position of (0.01 m) to (0.03 m) from the magnet in a time interval (Δt), a steady induced e.m.f. of (2.2×10^{-4} V) is generated in the loop. Calculate (Δt). (2 marks)

28) a) Write the **two types** of transformers. (2 marks)

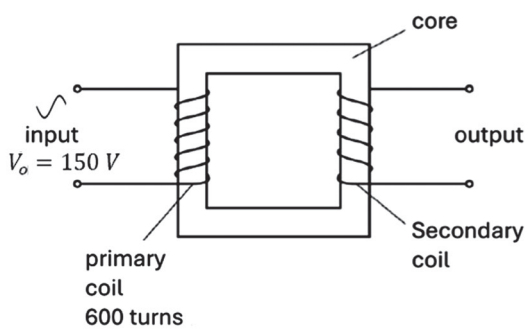
1. _____

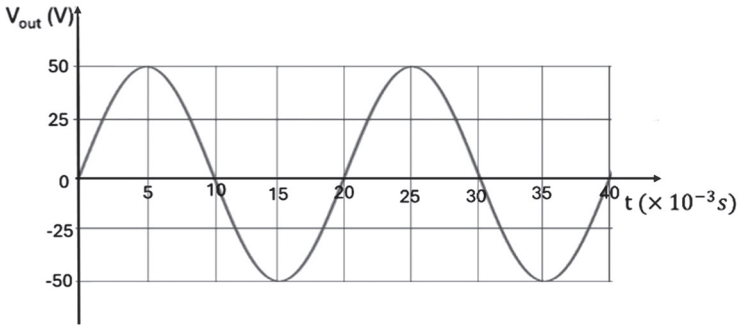
2. _____

b) What is meant by smoothing by a capacitor? (1 mark)

Question 2 continued

c) The figure below shows an ideal transformer and the graph of the induced electromotive force (V_{out}) versus time (t) across the secondary coil.





i) Write an expression for the output potential (V_{out}) variation as a function of time (t) in the form of $x = x_0 \ sin(\omega t)$. (3 marks)

ii) Calculate the number of turns in the secondary coil. (2 marks)

iii) A resistor is connected across the output terminals of the secondary coil. The mean power dissipated in the resistor is (0.8 W).

Calculate the resistance of the resistor. (2 marks)

[End of Examination]

FORMULA AND CONSTANTS

Electricity

$V = IR$	$R = \frac{\rho L}{A}$	$I = Anvq$	$Q = It$	$Q = Ne$
$I = I_1 + I_2$		$E = V_1 + V_2$	$emf = IR + Ir$	$\frac{E_A}{E_B} = \frac{L_A}{L_B}$

Capacitance

$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$	$C = C_1 + C_2$	$C = \frac{Q}{V}$
$x = x_o e^{-t/\tau}$	$lnx = lnx_o - \frac{1}{RC}t$	$\tau = RC$

Magnetic fields and electromagnetism

$r = \frac{mv}{Bq}$	$F_E = qE$	$F = BIL\sin\theta$	$F = qvBsin\theta$	$KE = \frac{1}{2}mv^2$

Electromagnetic induction

$\Phi = BAcos\theta$	$\Phi = BAsin\theta$	$E = \frac{-\Delta(N\Phi)}{\Delta t}$

Alternating current

$V_{r.m.s} = \frac{V_o}{\sqrt{2}}$	$I_{r.m.s} = \frac{I_o}{\sqrt{2}}$	$\frac{N_s}{N_P} = \frac{V_s}{V_P} = \frac{I_P}{I_s}$	$\omega = \frac{2\pi}{T}$
$P_{max} = I_o V_o$	$P_{max} = 2\,P_{mean}$	$P_{mean} = I_{r.m.s}\,V_{r.m.s}$	$x = x_0\sin(\omega t)$

Constants

$e = 1.6\times10^{-19}C$	$m_e = 9.11\times10^{-31}kg$	$m_p = 1.67\times10^{-27}kg$

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GENERAL EDUCATION DIPLOMA EXAMINATION

Diploma, Bilingual

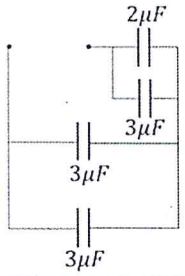
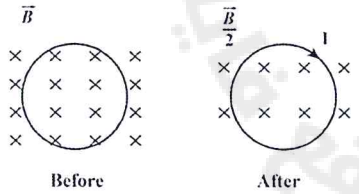
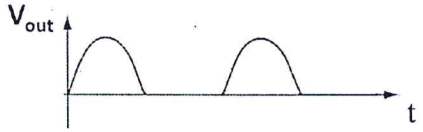
Physics 1st Semester, 1st Session 2024-2025

Marking Guide

Note: the marking guide in (14) pages | Full marks: (70)

ANSWERS TO MULTIPLE CHOICE QUESTIONS :(14 marks)

Item	Answer	Mark	C.L	OB	P.N
1	Current	1	K	1.1 a	H 173 O 96
2	Ohm	1	K	1.2 e	H 166 O 100
3	2.5R	1	R	1.3 g	H 183 O 108
4	0.1A	1	A	1.1 d	H 164 O 97
5	10 Ω	1	A	1.2 h	H 166 O 100
6	23.4 cm	1	A	1.4 d	H 188 O 115

7		1	A	2.1 d	H 305-306 O 224-227
8	The magnetic poles always occur in pairs.	1	K	3.1 b	H 327 O 236
9	2.5×10^{-5}T	1	A	3.3 f	H 320-321 O 246-247
10	Repulsion | Attraction	1	R	3.1 c	H 327 O 236
11	**a** and **b** loops	1	A	4.1 g	H 333 O 254
12		1	R	4.1 e	H 333 O 254
13		1	K	5.4 c	H 345 O 259
14	2.1 A	1	A	5.1 d	H 344 O 260

ANSWERS TO EXTENDED QUESTIONS :(56 marks)

Item	Part	Answer	Mark	C.L	OB	P.N
15	a	Resistivity OR the material of the wire Length of the conductor Cross-section area/ thickness / radius / diameter Temperature (OR) Heat. **Any three from above**	1 1 1	K	1.2 k	H 170 O 101

Item	Part	Answer	Mark	C.L	OB	P.N
16	a	Ohm's law states that, for a metallic conductor at a constant temperature, the current in the conductor is proportional to the potential difference across it. **(OR)** Ohm's law states that the potential difference across a conductor metallic is proportional to the current through it, provided the physical conditions do not change. (1)	1	K	1.2 f	H 168 O 101
	b	The sum of the currents entering a junction in a circuit is always equal to the sum of the currents leaving a junction. **(OR)** At any junction in a circuit, the total current leaving the junction is equal to the total current entering the junction. (1)	1	K	1.3 a	H 182 O 106

Item	Part	Answer	Mark	C.L	OB	P.N
17		1- Forward bias **(OR)** Forward direction 2- Reverse bias **(OR)** Reverse direction	1 1	K	1.2 i	H 168-169 O 112

Item	Part	Answer	Mark	C.L	OB	P.N
18	a	$R_{series} = 2 + 2 = 4\Omega$ $\frac{1}{R_{parallel}} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ $R_{total} = 2\Omega$ **(OR)** $R_{total} = \frac{4\times4}{4+4}$ (1) $= 2\Omega$ (1) **(OR)** $R_{total} = \frac{R}{n} = \frac{4}{2}$ (1) $= 2\Omega$ (1)	1 1	A	1.2 i	H 168-169 O 112
	b	**Carry on errors should be considered** $I = \frac{V}{R} = \frac{12}{2}$ $I = 6A$	1 1	A	1.3 g	H 168- 169 O 112

Item	Part	Answer	Mark	C.L	OB	P.N
19	a	$I = \frac{Q}{t}, \quad Q = I.t = 2 \times 0.002 = 0.004\ C$ $Q = Ne \rightarrow N = \frac{Q}{e}$ $= \frac{0.004}{1.6 \times 10^{-19}}$ $N = 2.5 \times 10^{16}$ electrons	1 1 1	A	1.1 b	H 146 O 132
	b	☑ Series Increasing the total resistance will reduce the current, and in turn, decreases the number of electrons flowing. **(OR)** $R\ \alpha\ \frac{1}{I}$ *and* $I\ \alpha$ number of electrons (1) **The student gets the mark only if both the choice and the explanation are correct.**	1	R	1.1 b	H 146 O 132

Item	Part	Answer	Mark	C.L	OB	P.N
20		$R = \frac{\rho L}{A}$ $A = \frac{\rho L}{R} = \frac{1.72 \times 10^{-8} \times 0.7}{7 \times 10^{-3}}$ $= 1.72 \times 10^{-6}\, m^2$ $A = \pi\, r^2$ $r = \sqrt{\frac{A}{\pi}} = \sqrt{\frac{1.72 \times 10^{-6}}{\pi}} = 7.4 \times 10^{-4} m$ **(OR)** $R = \frac{\rho L}{\pi\, r^2}$ $r = \sqrt{\frac{\rho L}{\pi R}}$ (1) $r = \sqrt{\frac{1.72 \times 10^{-8} \times 0.7}{\pi \times 7 \times 10^{-3}}}$ (1) $r = 7.4 \times 10^{-4} m$ (1)	1 1 1 1	R	1.2 1	H 170 O 101

Item	Part	Answer	Mark	C.L	OB	P.N
21	a	$I_2 = I_3 - I_1 = 4 - 1.5 = 2.5\ \text{A}$ **(OR)** From loop acdfa: $24 - 4.4\, I_2 + (2 \times 1.5) - 16 = 0$ $I_2 = 2.5\ \text{A}$ (1)	1	A	1.3 h	H 182 O 106
	b	From loop ebcde: $E_1 - I_1R_1 - I_3R_3 = 0$ $16 - 2 \times 1.5 - 4R_3 = 0$ $R_3 = 3.25\Omega$ **(OR)** From loop abefa: $E_2 - I_2R_2 - I_3R_3 = 0$ (1) $24 - 4.4 \times 2.5 - 4R_3 = 0$ (1) $R_3 = 3.25\Omega$ (1) **The student gets the full mark if substituted directly in a correct loop and gets the accurate result.**	1 1 1	A	1.3 h	H 182 O 106

Item	Part	Answer	Mark	C.L	OB	P.N
22	a	$Q_o = CV = 4 \times 10^{-6} \times 9 = 3.6 \times 10^{-5} C$ $Q = Q_o \times e^{\frac{-t}{\tau}} = Q_o \times e^{\frac{-t}{RC}}$ $\frac{Q}{Q_o} = e^{\frac{-t}{\tau}}$ $ln\frac{Q}{Q_o} = ln\frac{4.87 \times 10^{-6}}{3.6 \times 10^{-5}}$ $ln\frac{Q}{Q_o} = -2 = \frac{-t}{\tau}$ $t = 2\tau$	1 1 1	A	2.1 c 2.1 i	H 308,310 O 222,231
	b	☑ $\frac{Q_o}{2}$ In parallel, the charge redistributes equally. The charge on C becomes **half** of its initial charge, or $\frac{Q_o}{2}$ **The student gets the mark only if both the choice and the explanation are correct.** **Any correct explanation or mathematical proof is acceptable.**	1	R	2.1 e	H 305-306 O 224-227
	c	1- To store energy 2- To give a smoother output p.d	1	K	2.1 l	H 311 O 228

		3- Reduce the ripple on rectified or voltage **Any one from above with similar meaning**				

Item	Part	Answer	Mark	C.L	OB	P.N
23	a	$F = BIL$ $I = \frac{F}{BL} = \frac{0.6}{0.9 \times 12 \times 10^{-2}}$ $= 5.6A$	1 1	A	3.2 b	H 318,319 O 241
	b	- Magnetic flux density (or) magnetic field. - Electric current. - Length of the wire or conductor. - The angle between the magnetic field and the electric current.	1 1 1 1	K	3.2 a	H 318,319 O 241

Item	Part	Answer	Mark	C.L	OB	P.N
24	a	$F_{E_x} = q_X E$ $q_X = \frac{F_{E_X}}{E} = \frac{3.2\times10^{-14}}{4\times10^{4}}$ $q_X = 8 \times 10^{-19} C$	1 1	A	3.3 f	H 320-321 O 246-247
	b	**Carry on errors should be considered** $v_X = \frac{r_X B q_X}{m} = \frac{3 \times 10^{-2} \times 0.5 \times 10^{-3} \times 8 \times 10^{-19}}{5.0 \times 10^{-28}}$ $v_X = 2.4 \times 10^{4} m/s$	1 1	A	3.3 f	H 320-321 O 246-247
	c	$F_{B_x} = B q_X v_X$, $F_{E_y} = 2\, F_{E_x}$, $q_Y = 2q_X$ $F_{B_Y} = B q_Y v_Y = B 2 q_X 2 v_X = 4 B q_X v_X$ $\frac{F_X}{F_Y} = \frac{1}{4}$ **(OR)** $F_Y = 4F_x$ (1) **If correct numerical solution is provided, give 2 marks**	1 1	R	3.3 b	H 320-321 O 246-247

Item	Part	Answer	Mark	C.L	OB	P.N
25		The product of the magnetic flux density B and the area A. **(OR)** The product of the magnetic flux density B and the area A normal to the lines of flux. (1)	1	K	4.1 a,c	H 330 O 255
		Magnetic flux linkage	1			

Item	Part	Answer	Mark	C.L	OB	P.N
26		$\phi_1 = BA\sin\theta_1 = 0.05 \times 0.2 \times sin30 = 5 \times 10^{-3}\ Wb$ $\phi_2 = \text{BAsin}\,\theta_2 = 0.05 \times 0.2 \times sin55 = 8.2 \times 10^{-3}\ Wb$ $\Delta\phi = \phi_2 - \phi_1 = (8.2 - 5) \times 10^{-3}$ $= 3.2 \times 10^{-3}\ Wb$ **(OR)** $\alpha_1 = 90 - \theta_1 = 60°$, $\alpha_2 = 90 - \theta_2 = 35°$ (1) $\phi_1 = BA\cos\alpha_1 = 0.05 \times 0.2 \times cos60 = 5 \times 10^{-3}\ Wb$ $\phi_2 = BA\cos\alpha_2 = 0.05 \times 0.2 \times cos35 = 8.2 \times 10^{-3}\ Wb$ (1) $\Delta\phi = \phi_2 - \phi_1 = 3.2 \times 10^{-3}\ Wb$ (1) **If the student used cos instead of sin with the angles given in the question he loses one mark.** **(OR)** $\Delta\phi = \phi_2 - \phi_1$ $= BA\cos(90 - \theta_2) - BA\cos(90 - \theta_1)$ (1) $= BA\cos(90 - 55) - BA\cos(90 - 30)$ (1) $= 3.2 \times 10^{-3}\ Wb$ (1) **If the student did it in one step he gets the 3 marks.**	1 1 1 1	A	4.1 b	H 331 O 256

Item	Part	Answer	Mark	C.L	OB	P.N
27	-	$\Delta t = \frac{\Delta\varphi}{-e.m.f.} = \frac{(0.2 - 1.2) \times 10^{-3}}{-2.2 \times 10^{-4}}$ $= 4.5\ s$	1 1	R	4.1 f	H 333 O 256

Item	Part	Answer	Mark	C.L	OB	P.N
28	a	1- Step-up transformer 2- Step-down transformer	1 1	K	5.2 a	H 336, 344 O 261
	b	The process of reducing the fluctuations in the unidirectional output. **(OR)** The capacitor discharges through the resistor as the output p.d. decreases to smooth the current through the resistor. (1)	1	K	5.4 f	H 346 O 259

	c-i	$max\ value\ of\ e.m.f\ =\ 50\ V$ $T\ =\ 20\ ms$ $\omega = \frac{2\pi}{T} = \frac{2\pi}{20\times10^{-3}} = 314$ rad/s $V = 50\,sin(314\,t)$ volt **(OR)** $V = 50\,sin(100\pi\,t)$ volt **(OR)** $V = 50\,sin\left(\frac{2\pi}{20\times10^{-3}}\,t\right)$ volt **If the student wrote the correct expression directly, he should get the 3 marks**	1 1 1	A	5.1 b	H 341 O 258,260
	c-ii	$\frac{N_s}{V_s} = \frac{N_p}{V_p}, \qquad N_s = \frac{N_p V_s}{V_p}$ $= \frac{600\ \times 50}{150}$ $= 200\ turns$	1 1	A	5.2 b	H 344, 336 O 260, 261
	c-iii	$P_{max} = 2 \times P_{mean} = 2 \times 0.8 = 1.6\ W$ $P_{max} = I_o^2 R = \frac{V_o^2}{R}$ $R = \frac{V_o^2}{P_{max}} = \frac{(50)^2}{1.6} = 1562.5\ \Omega = 1.56\ k\Omega$ **(OR)** $P_{max} = 2 \times P_{mean} = 2 \times 0.8 = 1.6\ W$ (1) $P_{max} = I_o V_o \qquad I_o = \frac{P_{max}}{V_o} = \frac{1.6}{50} = 0.032\ A$ $R = \frac{V_o}{I_o} = \frac{50}{0.032} = 1562.5\ \Omega$ (1)	1 1	R	5.1 c, 5.3 b	H 336, 344 O 260

		(OR) $R = \frac{V_{r.m.s.}^2}{P_{mean}} = \frac{V_o^2}{2 \times P_{mean}}$ (1) $= \frac{(50)^2}{2 \times 0.8} = 1.56\ k\Omega$ (1)				

End of Marking Guide