

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 ١٤٤٨/١٤٤٧ هـ - ٢٠٢٥ / ٢٠٢٦ م

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١٤) 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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1) A charge of (1.2 C) flows in (5.0 s). What is the current?

(Shade in the bubble (○) next to the correct answer)

- ○ 0.24 A
- ○ 4.17 A
- ○ 6.00 A
- ○ 6.20 A

[1]

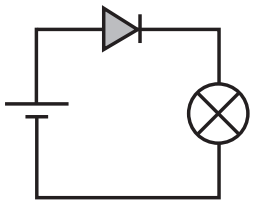
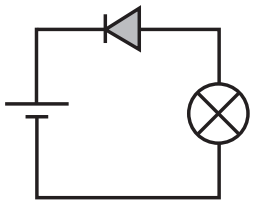
2) Define electromotive force (e.m.f).

_____

_____

[1]

3) Distinguish between the two types of diode connections by completing the table below:

Type of diode connection	_____	_____
Circuit sketch		
Conductivity	Conduct electricity	_____

[3]

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4) An electric vehicle battery is charged from a charging station. The battery voltage is (385 V).

If a charge of (1.8×10^5 C) passes through the battery, calculate the energy transferred (W) to the battery.

W = _____ J [2]

5) **Figure 5-1** shows two copper wires (X) and (Y) of different diameters which are joined together and carry the same current.

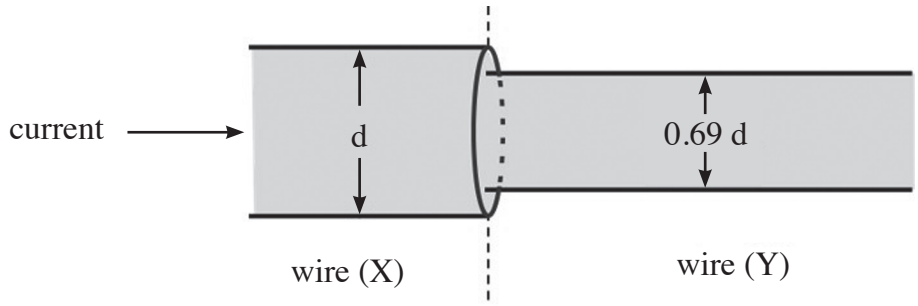


Figure 5-1

Determine the ratio of the average drift speed of free electrons in wire (Y) to that in wire (X), $(\frac{v_Y}{v_X})$.

$\frac{v_Y}{v_X}$ = _____ [3]

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6) A wire is made of three different materials (A, B and C), with resistivities (ρ, 2ρ and 3ρ) respectively. A current (I) is passing through the wire as shown in **Figure 6-1**.

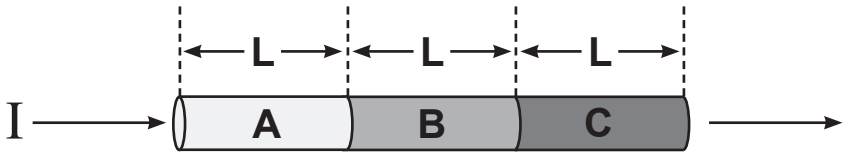
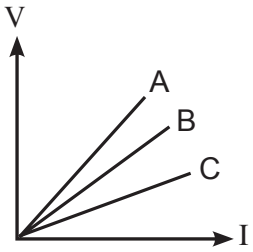
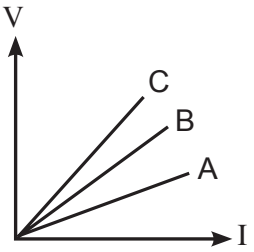


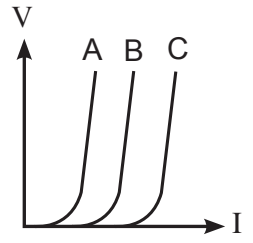
Figure 6-1

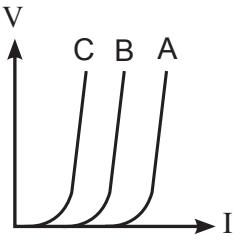
Which graph correctly shows the variation of potential difference (V) versus the current (I) through the materials?

(Shade in the bubble (⬭) next to the correct answer)

⬭ 

⬭ 

⬭ 

⬭ 

[1]

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7) A cable of length (1×10^3 m) and resistance (0.052 Ω) is made of (38 identical aluminum wires) connected in parallel as shown in **Figure 7-1**.

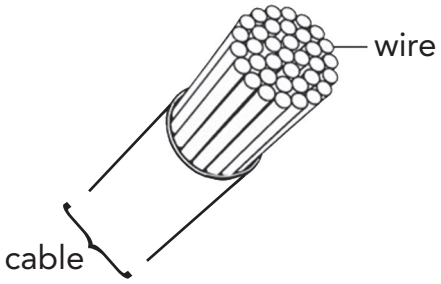


Figure 7-1

If the resistivity of aluminum is (2.6×10^{-8} Ω m), calculate the cross-sectional area (A) of a single wire of the cable.

A = _____ m^2 [4]

8) A circuit in **Figure 8-1** is set up to study how the terminal potential difference (V) across a cell changes with current (I) as the resistance (R) is varied. The graph in **Figure 8-2** shows the relation obtained.

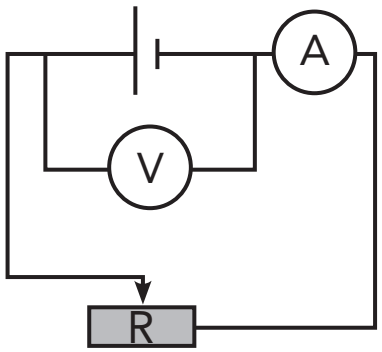


Figure 8-1

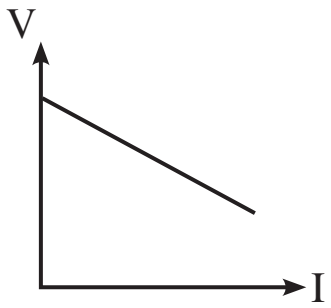


Figure 8-2

What can be deduced from the slope of the graph?

(Shade in the bubble (⬭) next to the correct answer)

⬭ The e.m.f. of the cell.

⬭ The power dissipated by the cell.

⬭ The internal resistance of the cell.

⬭ The resistance of the variable resistor. [1]

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9) **Figure 9-1** shows an electric circuit.

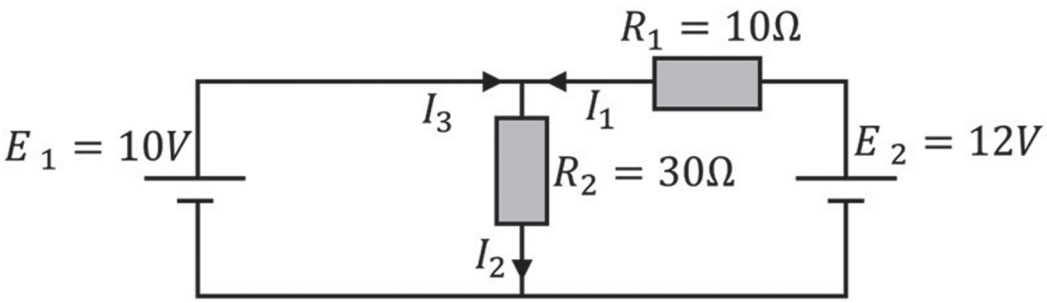


Figure 9-1

Determine I_3.

$I_3 =$ _____ A [6]

10) Compare Kirchoff's laws in terms of quantities conserved:

	Kirchoff's first law	Kirchoff's second law
Quantity conserved	_____	_____

[2]

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11) **Figure 11-1** shows a potentiometer. The length of the resistive wire (XY) is (1 m) and the equilibrium point is obtained at point (Z).

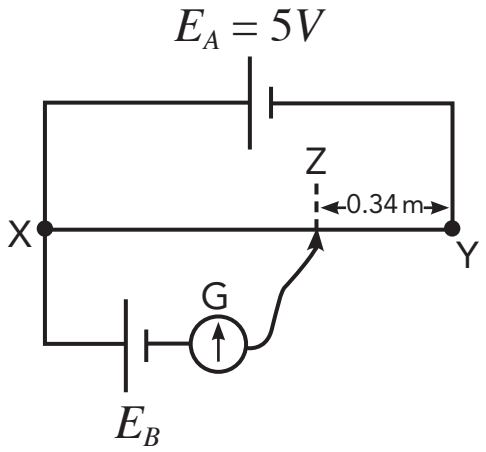


Figure 11-1

If the internal resistance of the cells is negligible, calculate (E_B).

E_B = _____ V [2]

12) "The charge stored per unit potential difference" is the definition of:

(Shade in the bubble (○) next to the correct answer)

○ Current ○ Resistance

○ Energy ○ Capacitance [1]

13) A fully charged capacitor of capacitance ($C = 2\ \mu F$) is discharged through a resistor (R). What is the value of (R) if the time constant is ($\tau = 6 \times 10^{-3}$ s)?

(Shade in the bubble (○) next to the correct answer)

○ 667 Ω ○ 1200 Ω

○ 3000 Ω ○ 5400 Ω [1]

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14) **Figure 14-1** shows an electric circuit.

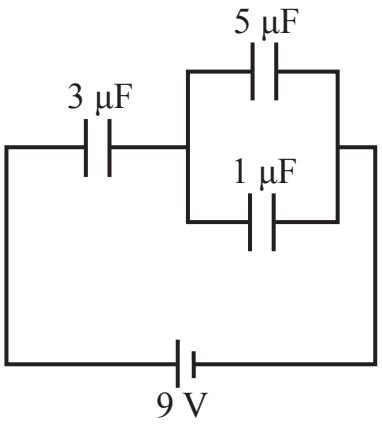


Figure 14-1

a. Calculate the combined capacitance of the three capacitors.

C_T= _____ μF [3]

b. Calculate the potential difference across the capacitor of capacitance (3 μF).

V = _____ V [3]

15) The graph in **Figure 15-1** shows the variation of current (I) versus time (t) for a discharging capacitor.

What is the value of the current at (t = 0 s)?

(Shade in the bubble (○) next to the correct answer)

- ○ 0.38 A
- ○ 0.43 A
- ○ 0.49 A
- ○ 0.61 A

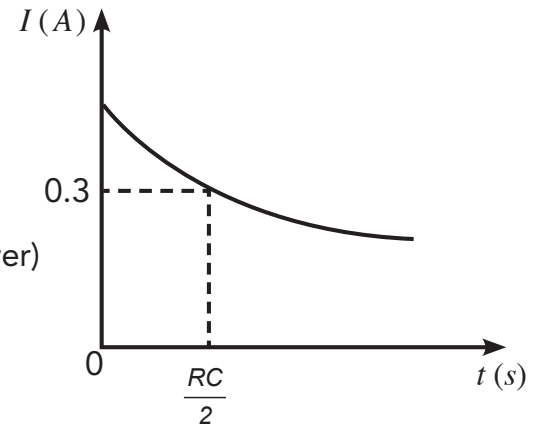


Figure 15-1

[1]

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16) **Figure 16-1** shows an electron enters a region of a uniform magnetic field perpendicularly with a speed of (6×10^6 m s^{-1}). The electron experiences a magnetic force of magnitude (1.2×10^{-16} N).

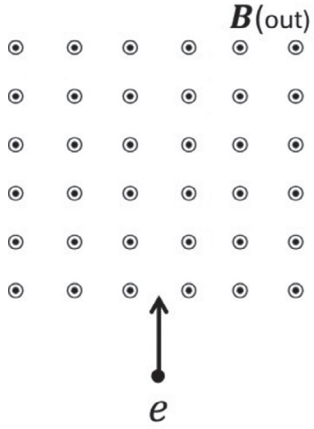


Figure 16-1

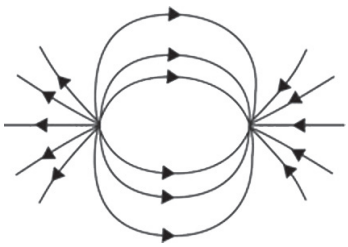
a. **On the figure,** draw the path of the electron inside the magnetic field area. [1]

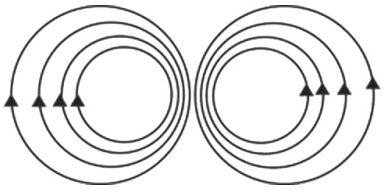
b. Calculate the radius of the circular path of the electron in the magnetic field.

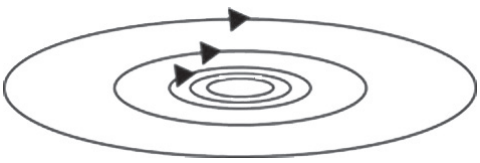
r = _____ m [4]

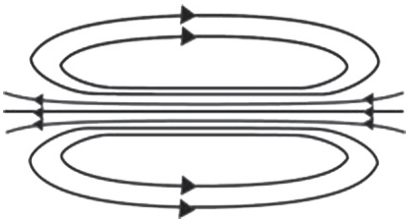
17) Which of the following figures correctly represents the magnetic field pattern for a current carrying solenoid?

(Shade in the bubble (⬭) next to the correct answer)

⬭ 

⬭ 

⬭ 

⬭ 

[1]

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18) Complete the following table:

Term	Definition	Unit
_____	The force per unit current per unit length on a current-carrying wire placed perpendicularly to the field lines.	_____

[2]

19) **Figure 19-1** shows a thin slice of a semiconducting material of thickness (t_1) placed in a uniform magnetic field (B). When electrons enter the slice, a voltage V_{H_1} is produced between two faces of the slice. The different faces are labeled as indicated in **Figure 19-2**.

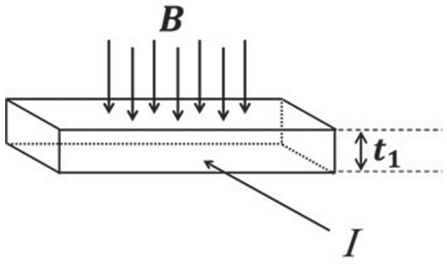


Figure 19-1

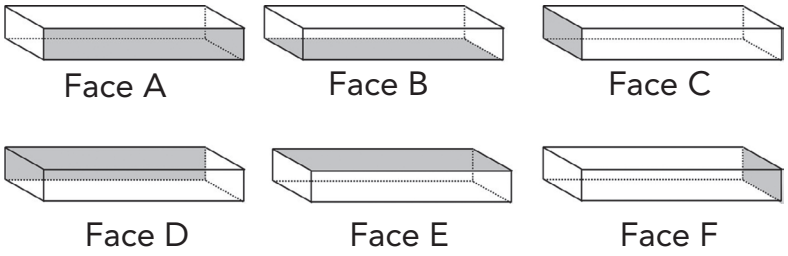


Figure 19-2

a. Between which two faces is the hall voltage produced?

(Shade in the bubble (○) next to the correct answer)

- ○ Face A and face D
- ○ Face C and face F
- ○ Face D and face B
- ○ Face A and face E

[1]

b. When the slice is replaced with another slice of the same material but with thickness ($t_2 = 3t_1$), find the ratio $\frac{V_{H_1}}{V_{H_2}}$

_____

_____

$\frac{V_{H_1}}{V_{H_2}}$ = _____ [2]

c. State one use of hall probe.

_____

[1]

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20) In a beam tube, a variable potential difference is used to accelerate electrons to enter a uniform magnetic field (B).

Figure 20-1 shows the variation of the square of the radius (r^2) of the electrons circular path versus the potential difference (V).Given that the slope of the graph is ($4.6 \times 10^{-5}\ m^2\ V^{-1}$), calculate the magnitude of the magnetic flux density.

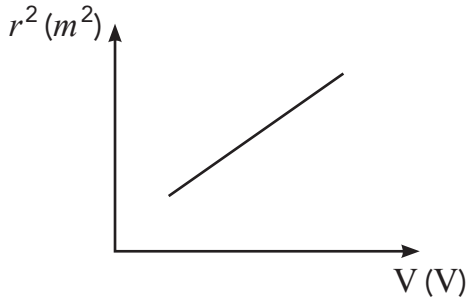


Figure 20-1

B = _____ T [3]

21) Which of the following relations is correct?

(Shade in the bubble (⬭) next to the correct answer)

⬭ 1 weber = 1 T.m

⬭ 1 weber = 1 T^2.m

⬭ 1 weber = 1 T.m^2

⬭ 1 weber = 1 T^2.m^2

[1]

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22) A single-turn coil is located in a variable magnetic flux that changed by (-3×10^{-3} Wb) in (0.01 s).
Calculate the induced e.m.f.

e.m.f = _____ V [2]

23) **Figure 23-1** shows a square coil placed perpendicular to a magnetic field of magnetic flux density of (1.8×10^{-5} T).

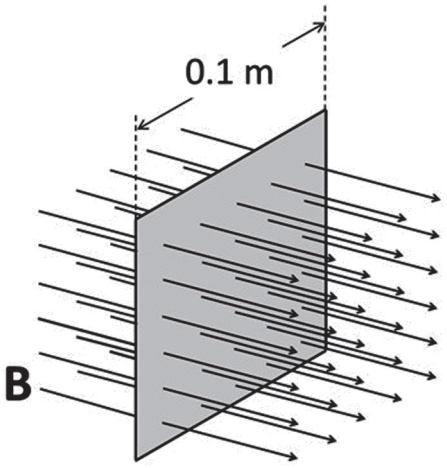


Figure 23-1

a. Calculate the magnetic flux (Φ) through the coil.

Φ = _____ Wb [2]

b. Define magnetic flux.

[1]

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24) **Figure 24-1** shows a conducting wire placed above magnet poles.

In which of the following cases will the voltmeter reading be **the greatest**?

(Shade in the bubble (⬭) next to the correct answer)

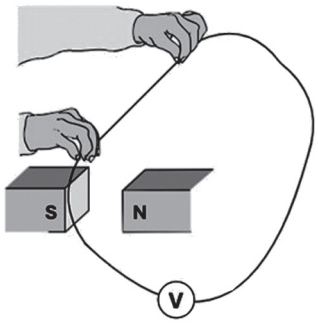


Figure 24-1

	Motion of wire	Motion of magnetic poles
⬭	Down with speed (v)	Held stationary
⬭	Held stationary	Up with speed (v)
⬭	Down with speed (v)	Down with speed (v)
⬭	Down with speed (v)	Up with speed (v)

[1]

25) **Figure 25-1** shows the variation of the potential difference (V) with time (t).

Which of the following equations correctly represents the alternating voltage?

(Shade in the bubble (⬭) next to the correct answer)

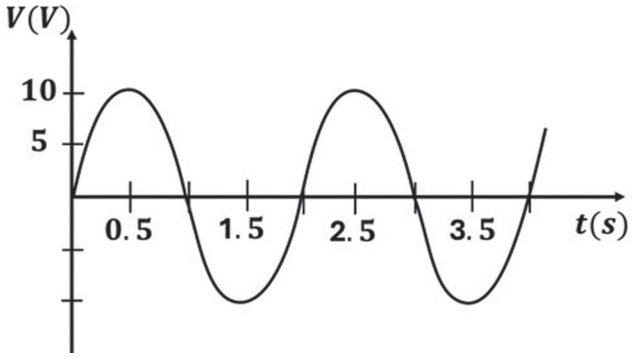


Figure 25-1

⬭ V= 5 sin (πt)

⬭ V= 5 sin (4πt)

⬭ V= 10 sin (πt)

⬭ V= 10 sin (2πt) [1]

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26) **Figure 26-1** shows an ideal transformer supplied with an (a.c.) voltage of (240 V) and a current of (0.15 A).

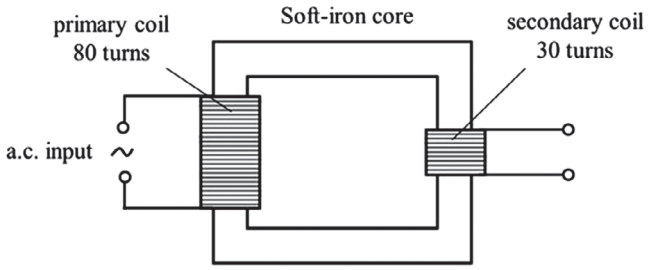


Figure 26-1

a. Calculate the voltage across the secondary coil.

V = _____ V [2]

b. Calculate the power of the primary coil.

P= _____ W [2]

c. If the primary coil of the transformer is connected to a (d.c.) source, explain why the bulb will not light up.

[1]

d. Which type of electric transformer is used to decrease the peak value of the voltage?

[1]

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27) In an (a.c.) circuit, the current (I) passing through the ammeter varies with time (t) according to the equation:

$I = 6.0 \sin(6250\ \pi t)$, where ($I$) is in ($A$) and ($t$) is in ($s$)

a. Calculate the period (T) of the (a.c.) current.

$T =$ _____ s [2]

b. Determine the peak current (I_0).

$I_0 =$ _____ A [1]

c. Calculate ($I_{r.m.s.}$).

$I_{r.m.s.} =$ _____ A [2]

28) **Figures 28-1** and **28-2** show the variation of the input and output voltages of a given electric circuit respectively.

Which electrical components are present in the circuit?

(Shade in the bubble (⬭) next to the correct answer)

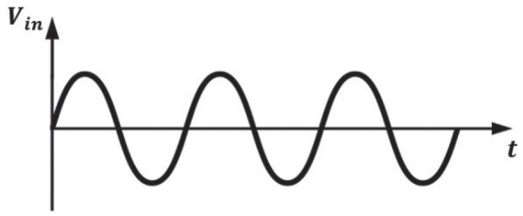


Figure 28-1

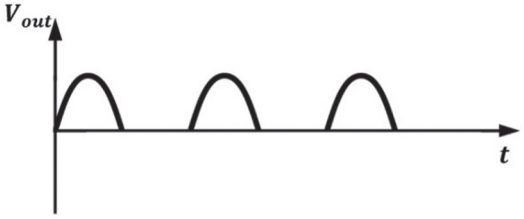


Figure 28-2

⬭ One diode and a capacitor.

⬭ One diode and no capacitor.

⬭ Four diodes and a capacitor.

⬭ Four diodes and no capacitor.

[1]

[End of Examination]

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Do not write in this space

FORMULA AND CONSTANTS

Electricity

$V = IR$	$R = \frac{\rho L}{A}$	$V = \frac{W}{Q}$	$Q = It$	$Q = Ne$
$I = I_1 + I_2$	$I = Anvq$	$\frac{E_X}{E_Y} = \frac{l_X}{l_Y}$	$V_{out} = \frac{V_{in}R_1}{R_1 + R_2}$	
$P = VI = I^2R = \frac{V^2}{R} = \frac{W}{t}$	$E = V_1 + V_2$	$emf = IR + Ir$	$E = Ir + IR$	

Capacitance

$C = C_1 + C_2$	$\mathrm{x} = \mathrm{x_o e}^{-t/\tau}$	$\tau = RC$	$C = \frac{Q}{V}$
$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$	$\ln x = \ln x_o - \frac{t}{\tau}$	$W = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$	

Magnetic fields and electromagnetism

$F = BIl\sin\theta$	$F_E = qE$	$F = qvBsin\theta$	$KE = \frac{1}{2}mv^2$
$v = \frac{E}{B}$	$r = \frac{mv}{Bq}$	$\frac{e}{m_e} = \frac{2V}{B^2r^2}$	$\mathrm{V}_H = \frac{BI}{ntq}$

Electromagnetic induction

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

Alternating current

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

Constants

$e = 1.6 \times 10^{-19}C$	$m_e = 9.11 \times 10^{-31}kg$

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

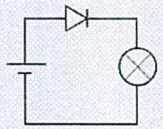
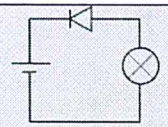
نموذج إجابة امتحان مادة الفيزياء للدبلوم العام للصفوف ثنائية اللغة

الفصل الدراسي: الأول - الدور: الأول

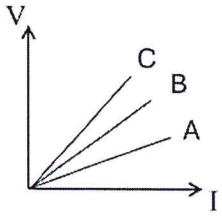
للعام الدراسي: 1448/1447هـ - 2026/2025م

سلطنة عمان
وزارة التربية والتعليم

Note: Marking scheme in (9) sheets. Total marks: 70

Item	Answer	Mark	Additional Information	Unit	Page		Learning Objectives	Assessment Objective
					Oxford	Hodd		
1	0.24 A	1		Electricity	96	162	1.1b	AO1
2	The energy transferred per unit charge that passes through the power supply. **(OR)** The electrical energy per unit charge produced inside the source. **(OR)** $e.m.f. = \frac{energy\ transffered\ from\ other\ forms\ to\ electrical\ in\ deriving\ charge\ around\ a\ complete\ circuit}{charge}$	1	Don't accept: $emf = \frac{W}{Q}$		99	178	1.2c	AO1
3	**Type of diode connection** / Forward bias / Reverse bias **Circuit sketch** /  /  **Conductivity** / Conduct electricity / Does not conduct electricity	1+1 1			103	198+169	1.2i	AO1
4	$W = QV$ $W = 1.8 \times 10^5 \times 385$ $W = 69.3 \times 10^6 J$	1 1			99	164-165	1.2b	AO1

وزارة التربية والتعليم
دائرة الاختبارات والإدارة الإشرافية
قسم الاختبارات الدولية

5	$\frac{v_Y}{v_X} = \frac{I_Y A_X n_X q}{I_X A_Y n_Y q}$ $\frac{v_Y}{v_X} = \frac{A_X}{A_Y} = \frac{r_X^2}{r_Y^2}$ $\frac{v_Y}{v_X} = \frac{(d)^2}{(0.69\,d)^2}$ $\frac{v_Y}{v_X} = 2.1$	1 1 1			97	164	1.1e	AO2
6		1			101+103	168+170	1.2h	AO2
7	$\frac{1}{R_{cable}} = \frac{38}{R_{wire}}$ $R_{wire} = 38 \times R_{cable}$ $R_{wire} = 38 \times 0.052 = 1.976\,\Omega$ $A = \frac{\rho L}{R} = \frac{2.6 \times 10^{-8} \times 1 \times 10^3}{1.976}$ $= 1.32 \times 10^{-5}\,m^2$	1 1 1 1			101	166-167	1.2l	AO2

سلطنة عمان
وزارة التربية والتعليم
دائرة الامتحانات وزارة التربية والتعليم
قسم الامتحانات والتقييم

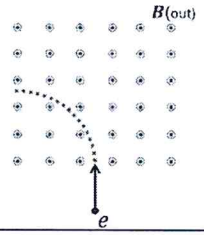
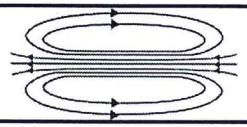
8	The internal resistance of the cell.	1		110	180-181	1.4b	AO2
9	From the left loop: $10 = R_2 I_2$ $10 = 30\ I_2$ $I_2 = 0.33\ A$ From the right loop: $12 = R_1 I_1 + R_2 I_2$ $12 = 10 I_1 + (0.33 \times 30)$ $I_1 = 0.2\ A$ $I_2 = I_1 + I_3$ So $I_3 = 0.33 - 0.2$ $I_3 = 0.13\ A$	1 1 1 1 1 1	Another solution: From the left loop: $10 = R_2 I_2$ [1] $10 = 30\ I_2$ $I_2 = 0.33\ A$ [1] From the outer loop: $12 - 10 = 10\ I_1$ [1] $I_1 = 0.2\ A$ [1] $I_2 = I_1 + I_3$ So $I_3 = 0.33 - 0.2$ [1] $I_3 = 0.13\ A$ [1]	106-107	182-183	1.3h	AO2
10		1+1		106-107	182-183	1.3a	AO1
11	$\frac{E_A}{E_B} = \frac{l_A}{l_B}$ $\frac{5}{E_B} = \frac{1}{1 - 0.34}$ $E_B = 3.3\ V$	1 1		114-115	188	1.4d	AO2

	Kirchoff's first law	Kirchoff's second law
Quantity conserved	Charge	Energy

وزارة التربية والتعليم والتعليم العالي
والهيئة العامة للامتحانات

12	Capacitance	1		Capacitance	222	303	2.1a	AO1
13	3000 Ω	1			231	311	2.1h	AO1
14 a	$C = 5 + 1$ $= 6\mu F$ $\frac{1}{C_T} = \frac{1}{6} + \frac{1}{3}$ $= \frac{1}{2}$ $C_T = 2\mu F$	1 1 1			224	305	2.1e	AO2
14 b	$Q_T = C_T \times V_T$ $Q_T = 2 \times 9 = 18\ \mu C$ $Q_3 = Q_T$ $V_3 = \frac{Q_T}{C_3}$ $V = \frac{18}{3}$ $V = 6\ V$	1 1 1	Full mark should be given if the student achieved $V = 6V$ by considering that $Q_{3\mu F} = Q_{(5+1)\mu F}$ And $C\alpha\frac{1}{V}$ $C_{3\mu F} = \frac{2}{3}V_T$		222	302-306	2.1c	AO2
15	0.49 A	1			230	310	2.1i	AO2

وزارة التربية والتعليم
والإدارة العامة للاختبارات والإدارة العامة للامتحانات
قسم الامتحانات والتقييم

16	a		1	1 mark for the direction to the **left.**	Magnetic fields and electromagnetism	244	321	3.3a	AO2
	b	$F = QvBsin90$ $B = \frac{1.2 \times 10^{-16}}{1.6 \times 10^{-19} \times 6 \times 10^{6}}$ $= 1.25 \times 10^{-4}\, T$ $r = \frac{mv}{Be}$ $\frac{9.11 \times 10^{-31} \times 6 \times 10^{6}}{1.25 \times 10^{-4} \times 1.6 \times 10^{-19}}$ $= 0.2733\, m$	1 1 1 1	Another solution: $F = ma$ $F = \frac{mv^2}{r}$ [1mark] $r = \frac{mv^2}{F}$ [1mark] $r = \frac{9.11\times10^{-31}\times(6\times10^{6})^2}{1.2\times10^{-16}}$ [1mark] $= 0.2733\, m$ [1mark]		244-246	320-321	3.3b 3.3f	AO2
17			1			236	327	3.1b	AO1
18		<table><tr><th>Term</th><th>Definition</th><th>Unit</th></tr><tr><td>Magnetic flux density **(OR)** Magnetic field strength</td><td></td><td>Tesla **(OR)** T **(OR)** N/A.m</td></tr></table>	1+1			240	319	3.2c	AO1

سلطنة عمان
وزارة التربية والتعليم
دائرة الاختبارات بدائرة الامتحانات
قسم الامتحانات النهائية

19	a	Face C and face F	1			245	325	3.3c	AO2
	b	$\frac{V_{H1}}{V_{H2}} = \frac{t_2}{t_1}$ $= \frac{3t_1}{t_1}$ $= 3$	1 1			245	325	3.3d	AO2
	c	To measure magnetic flux density.	1	Accept: - To measure magnetic field strength. - As a magnetic field sensor. - To study the properties of semiconductor		245	326	3.3c	AO1
20		$\frac{e}{m_e} = \frac{2V}{B^2r^2}$ $slope = \frac{r^2}{V} = \frac{2m_e}{B^2e}$ $B = \sqrt{\frac{2m}{e \times slope}}$ $= \sqrt{\frac{2 \times 9.11 \times 10^{-31}}{1.6 \times 10^{-19} \times 4.6 \times 10^{-5}}}$ $= 4.975 \times 10^{-4}\ T$	1 1 1			244-249	322-323	3.3h	AO2

21	$1\,weber = 1\,T.m^2$	1		Electromagnetic induction	255	330	4.1a	AO1
22	$E = \frac{-\Delta(N\Phi)}{\Delta t}$ $= \frac{-1 \times (-3 \times 10^{-3})}{0.01}$ $= 0.3\,V$	1 1			256	333	4.1f	AO1
23 a	$A = 0.1 \times 0.1 = 1 \times 10^{-2}\,m^2$ $\Phi = BA = 1.8 \times 10^{-5} \times 1 \times 10^{-2}$ $\Phi = 1.8 \times 10^{-7}\,Wb$	1 1			255	330	4.1b	AO2
23 b	The product of the magnetic flux density and the area normal to the lines of flux.	1	Accept: The number of magnetic flux density passing normally through an area.		255	330	4.1a	AO1
24	Down with speed (v) | Up with speed (v)	1			252	331	4.1g	AO2

سلطنة عمان
وزارة التربية والتعليم
وزارة الاختبارات والإدارة العامة للامتحانات
قسم الامتحانات العامة

25		$V = 10 \sin(\pi t)$	1		Alternating currents	258	341	5.1b	AO2
26	a	$V_s = \frac{N_s \times V_p}{N_p}$ $= \frac{30 \times 240}{80}$ $= 90\ V$	1 1			261-262	336-344	5.2b 5.3b	AO2
	b	$P = IV$ $= 240 \times 0.15$ $= 36\ W$	1 1			260	344	5.1d	AO1
	c	Because there is no change in the flux threading the secondary coil.	1	Accept: -Because the voltage in the secondary coil is Zero -No secondary voltage		261	336	5.2a	AO1
	d	Step down transformer.	1			261	336	5.2a	AO1
27	a	$T = \frac{2\pi}{\omega}$ $= \frac{2\pi}{6250\pi}$ $= 3.2 \times 10^{-4}\ s$	1 1			258	341	5.1a	AO1
	b	$I_0 = 6.0\ A$	1			258	341	5.1b	AO1

	c	$I_{r.m.s.} = \frac{I_o}{\sqrt{2}}$ $= \frac{6}{\sqrt{2}}$ $= 4.24\ A$	1 1			260	344	5.1d	AO1
28		One diode and no capacitor	1			259	345-347	5.4d	AO2

وزارة التعليم

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

الفصل الدراسي الأول - الدور الثاني

للعام الدراسي ١٤٤٨/١٤٤٧ هـ - ٢٠٢٥ / ٢٠٢٦ م

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١١) 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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1) Which of the following laws states that 'For a metallic conductor at constant temperature, the current in the conductor is proportional to the potential difference across it'? (Shade in the bubble (○) next to the correct answer)

○ Ohm's law ○ Lenz's law

○ Kirchhoff's first law ○ Kirchhoff's second law [1]

2) The graph in **Figure 2-1** shows the variation of the terminal potential difference (V) against current (I) supplied by a battery.

Write in the boxes what does the slope and the y-intercept of the graph represent.

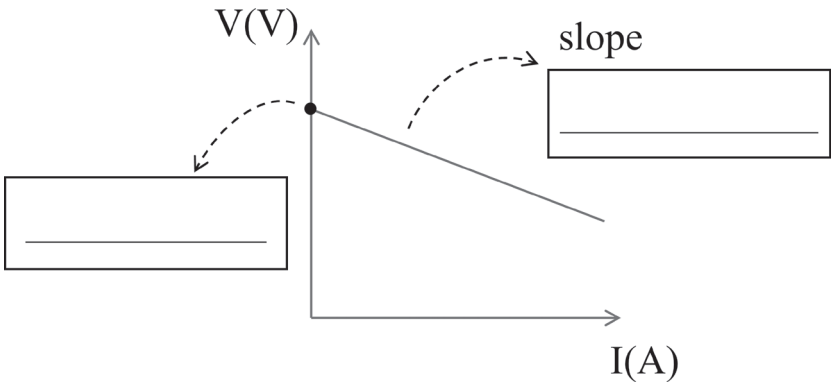


Figure 2-1 [2]

3) Which of the following physical quantities is conserved according to Kirchoff's first law?

(Shade in the bubble (○) next to the correct answer)

○ Energy ○ Charge

○ Power ○ Potential difference [1]

4) A heater uses a metal wire of constant resistance. When the supply voltage is (230 V), it takes (10 min) for the water to gain a certain amount of energy (W).

If the supply voltage is reduced to (210 V) to avoid overloading, calculate the heating time to gain the same amount of energy (W).

t = _____ min [3]

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5) Derive, using Kirchhoff's laws, the formula for the combined resistance for three resistors in parallel.

[3]

6) **Figure 6-1** shows an electrical circuit.

If another resistor is connected in parallel with (R), what will happen to the readings of the ammeter (A) and voltmeter (V)?

(Shade in the bubble (⬭) next to the correct answer)

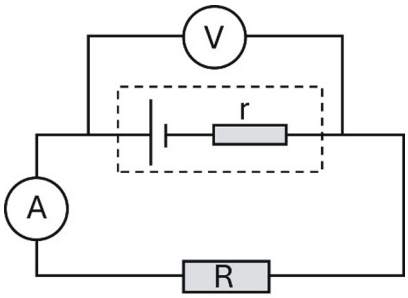


Figure 6-1

	Ammeter reading	Voltmeter reading
⬭	Decreases	Decreases
⬭	Increases	Increases
⬭	Increases	Decreases
⬭	Decreases	Increases

[1]

7) **Figure 7-1** shows an experiment to measure the resistance of a metal wire using an ohmmeter. The wire has a radius of (0.27×10^{-3} m) and a length of (1.25 m).

Calculate the resistivity of the wire.

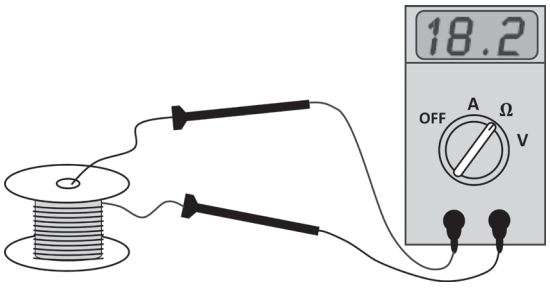


Figure 7-1

$\rho =$ _____ Ω m [3]

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8) **Figure 8-1** shows part of a circuit with four identical resistors each has a resistance of (3200 Ω).

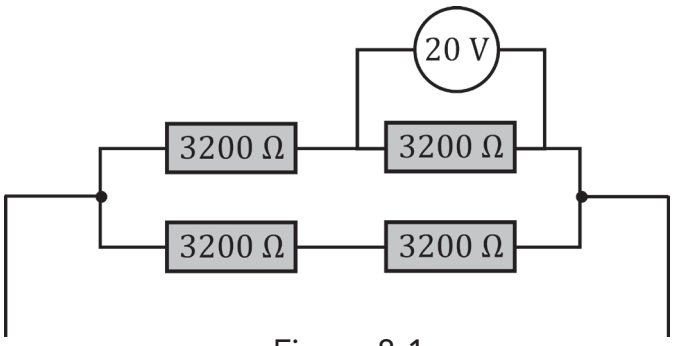


Figure 8-1

Show that the total power dissipated is (0.5 W).

[4]

9) A charge of (5.0 C) moves through a potential difference of (12 V). Calculate the work done on the charge.

$W =$ _____ J [2]

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10) **Figure 10-1** shows an electrical circuit.

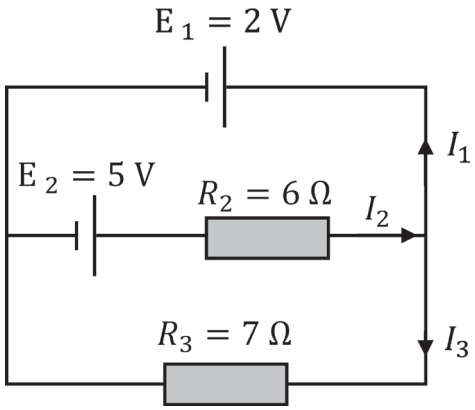


Figure 10-1

Calculate I_1.

I_1= _____ A [6]

11) Which circuit component is used to store electric energy?

(Shade in the bubble (○) next to the correct answer)

- ○ Resistor
- ○ Capacitor
- ○ Transformer
- ○ Voltmeter [1]

12) A fully charged capacitor (C) is discharging through a resistor of resistance (R = 1500Ω). What is the capacitance of (C) if the time constant is (τ = 0.012 s)?

(Shade in the bubble (○) next to the correct answer)

- ○ 1×10^{-6} F
- ○ 2×10^{-6} F
- ○ 8×10^{-6} F
- ○ 18×10^{-6} F [1]

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13) **Figure 13-1** shows the variation of $(\ln(V))$ versus (t) for a discharging capacitor through a resistor of resistance (3000 Ω).

a. Calculate the capacitance.

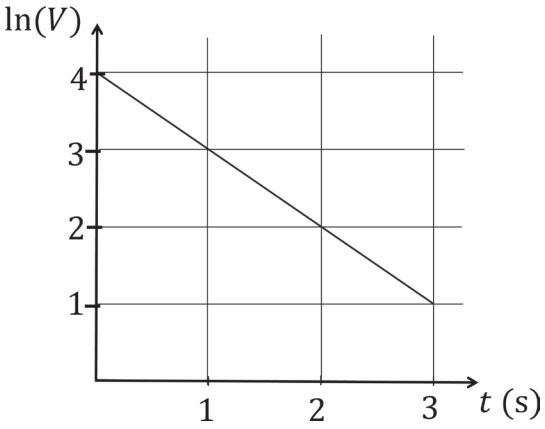


Figure 13-1

C = _____ F [4]

b. What is the value of the potential difference across the capacitor when it is fully charged?

V_o = _____ V [2]

14) A capacitor of capacitance (C_1) stores an amount of energy (W_1) when the potential difference across it is (V_1).

If the charge stored in the capacitor reaches 30% of its initial value, which row gives the correct values of potential difference and energy stored in the same capacitor?

(Shade in the bubble (⬭) next to the correct answer)

	Potential difference	Energy stored
⬭	0.7 V_1	0.09 W_1
⬭	0.3 V_1	0.21 W_1
⬭	0.7 V_1	0.21 W_1
⬭	0.3 V_1	0.09 W_1

[1]

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15) What does the **first finger** represent in *Fleming's Left-Hand Rule* as shown in **Figure 15-1**?

(Shade in the bubble (⬭) next to the correct answer)

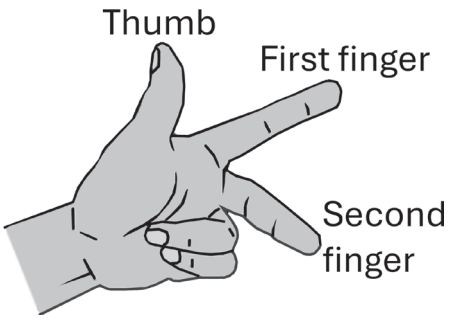


Figure 15-1

- ⬭ Direction of the conductor's motion
- ⬭ Direction of magnetic field
- ⬭ Direction of current
- ⬭ Direction of force [1]

16) **Figure 16-1** shows a wire of length (2.5 m) placed in a uniform magnetic field of flux density (0.1 T).The magnetic force on the wire is (0.081 N)

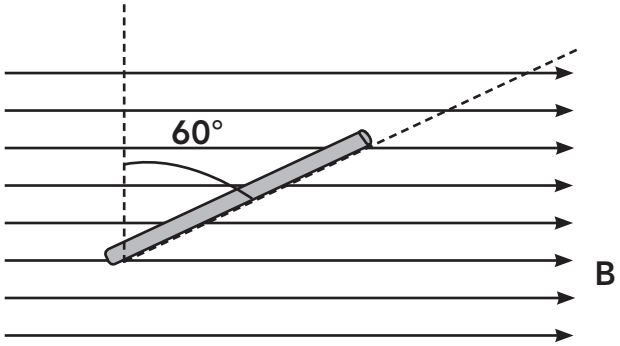


Figure 16-1

a. Calculate the current that flows in the wire.

$I =$ _____ A [3]

b. At what angle between the conductor and the magnetic field will the force on the wire have the greatest value?

$\theta =$ _____ $^{\circ}$ [1]

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17) **Figure 17-1** shows an electron which enters a uniform magnetic field of flux density (1.5×10^{-3} T). The magnetic force acting on the electron is (1.2×10^{-15} N).

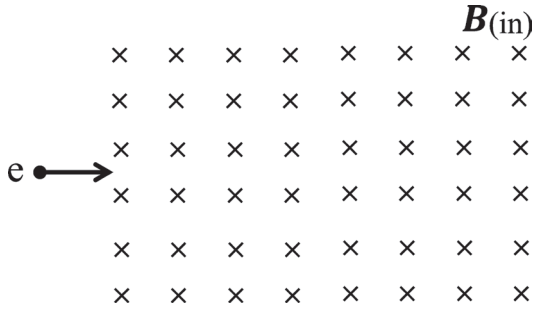


Figure 17-1

a. Calculate the speed of the electron in the region of the magnetic field.

$v =$ _____ ms^{-1} [2]

b. If an electric field is applied perpendicular to the magnetic field in an electron beam tube, prove that the velocity of the path of the charged particles when no deflection is given by $v = \frac{E}{B}$.

_____ [2]

18) State two factors that affect the hall voltage.

1- _____

2- _____ [2]

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19) **Figure 19-1** shows an electron of mass (m_e), speed (v_e) and charge (e) entering a uniform magnetic field. Another particle (Z) with the same charge and speed, but with a mass of ($\frac{5}{4} m_e$) enters the field (B).

If the radius of the path of the electron is ($r_e = 6.8 \times 10^{-4}$ m), calculate the radius of the path of the other particle (r_z).

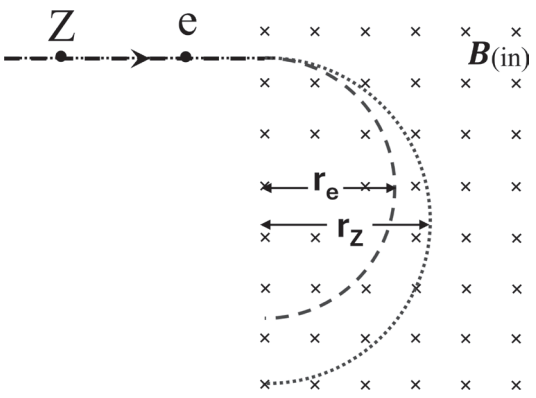


Figure 19-1

$r_z =$ _____ m [4]

20) **Figure 20-1** shows a rectangular loop moving with constant speed out of a uniform magnetic field region.

Which row correctly describes the magnitude of the induced e.m.f. and the direction of the induced current in the loop?

(Shade in the bubble (🖵) next to the correct answer)

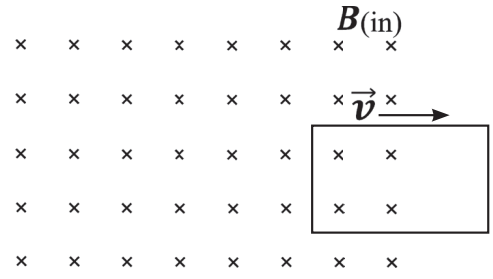


Figure 20-1

	Magnitude of the e.m.f	Direction of the induced current
🖵	Decreasing	Clockwise
🖵	Decreasing	Counterclockwise
🖵	Constant	Clockwise
🖵	Constant	Counterclockwise

[1]

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21) Which of the following is the unit of magnetic flux?

(Shade in the bubble (○) next to the correct answer)

○ Tesla ○ Weber

○ Ampere ○ Joule [1]

22) Figure 22-1 shows a graph of the variation of the induced e.m.f with time (t) of a single turn conducting coil entering a region of a uniform magnetic field perpendicularly with a constant speed.

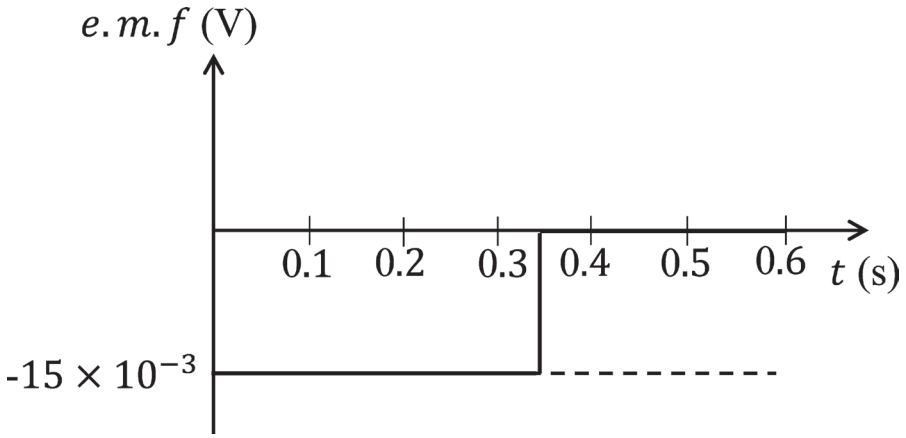


Figure 22-1

a. Calculate the change in flux during (t_1 = 0.2 s) to (t_2 = 0.3 s)?

$\Delta \Phi =$ _____ wb [2]

b. Name **three** factors that affect the magnitude of the induced e.m.f.

1- _____

2- _____

3- _____

[3]

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23) Which of the following quantities represents the time taken for one complete cycle for the alternating current?

(Shade in the bubble (⬭) next to the correct answer)

⬭ Period ⬭ Frequency

⬭ Peak value ⬭ Time constant [1]

24) An ideal transformer has (500 turns) on the primary coil and (2000 turns) on the secondary coil. A voltage of (176.8 V) is supplied to the primary coil.

a. What type of transformer is this?

_____ [1]

b. Calculate the voltage across the secondary coil.

_____

_____

_____

_____

V_s = _____ V [2]

25) In an a.c. circuit, the voltage (V) across a resistor varies with time (t) according to the equation:

$V = 4.0 \sin(6000\,\pi t)$, where ($V$) is in volts and ($t$) is in seconds.

a. Determine the value of the peak voltage.

V_o = _____ V [1]

b. Calculate the r.m.s voltage ($V_{r.m.s.}$)

_____

_____

$V_{r.m.s.}$ = _____ V [2]

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26) The mean power generated in a heater of resistance (36.0 Ω) is (1000 W). What is the peak voltage?

(Shade in the bubble (○) next to the correct answer)

○ 49.5 V ○ 132.3 V

○ 189.7 V ○ 268.3 V [1]

27) **Figure 27-1** shows the variation of the output potential difference (V_{out}) across the resistor with time (t) for a rectification circuit.

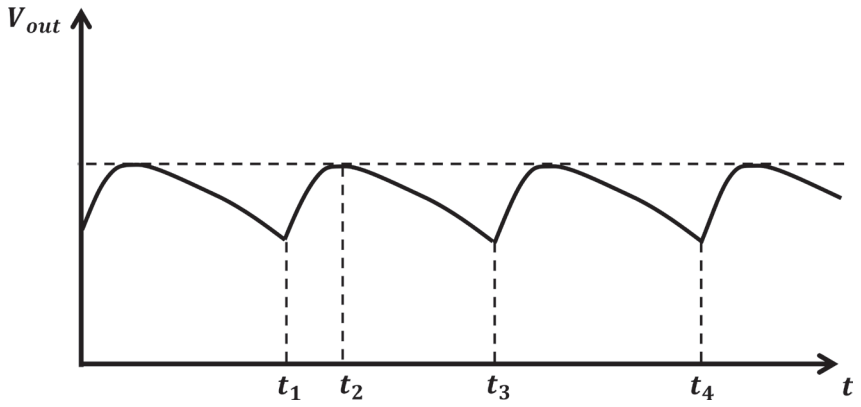


Figure 27-1

a. What type of rectification is used to obtain the above variation?

_____ [1]

b. What is the electric component used to reduce the fluctuations of the voltage?

_____ [1]

c. What is the time interval during which the capacitor is **only being charged**?

(Shade in the bubble (○) next to the correct answer)

○ t_1 to t_2 ○ t_1 to t_3

○ t_2 to t_3 ○ t_3 to t_4 [1]

d. Suggest **two** modifications in the rectification circuit that make the graph of the variation of the voltage (V_{out}) with time (t) smoother (with less fluctuations).

1- _____

2- _____ [2]

[End of Examination]

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FORMULA AND CONSTANTS

Electricity

$V = IR$	$R = \frac{\rho L}{A}$	$V = \frac{W}{Q}$	$Q = It$	$Q = Ne$
$I = I_1 + I_2$	$I = Anvq$	$\frac{E_X}{E_Y} = \frac{l_X}{l_Y}$	$V_{out} = \frac{V_{in}R_1}{R_1 + R_2}$	
$P = VI = I^2R = \frac{V^2}{R} = \frac{W}{t}$	$E = V_1 + V_2$	$emf = IR + Ir$	$E = Ir + IR$	

Capacitance

$C = C_1 + C_2$	$x = x_o e^{-t/\tau}$	$\tau = RC$	$C = \frac{Q}{V}$
$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$	$\ln x = \ln x_o - \frac{t}{\tau}$	$W = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$	

Magnetic fields and electromagnetism

$F = BIl\sin\theta$	$F_E = qE$	$F = qvBsin\theta$	$KE = \frac{1}{2}mv^2$
$v = \frac{E}{B}$	$r = \frac{mv}{Bq}$	$\frac{e}{m_e} = \frac{2V}{B^2r^2}$	$V_H = \frac{BI}{ntq}$

Electromagnetic induction

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

Alternating current

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

Constants

$e = 1.6 \times 10^{-19}C$	$m_e = 9.11 \times 10^{-31}kg$

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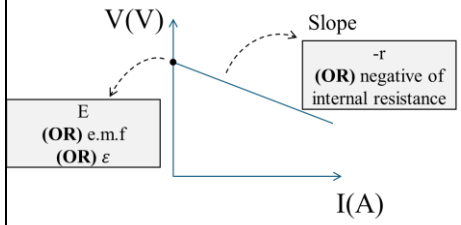
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نموذج إجابة امتحان مادة الفيزياء للدبلوم العام للصفوف ثنائية اللغة

الفصل الدراسي: الأول - الدور: الثاني

للعام الدراسي: 1448/1447هـ - 2026/2025م

Note: Marking scheme in (8) sheets. Total marks: 70

Item	Answer	Mark	Additional Information	Unit	Page		Learning Outcome	Assessment Objective
					Oxford	Hodd		
1	Ohm's law	1		**Electricity**	101	168	1.2 f	AO1
2		1+1	No mark for the negative sign of (r).		111	180	1.4b	AO2
3	Charge	1			106	181-182	1.3a	AO1
4	$P = \frac{V^2}{R} = \frac{W}{t}$ $t\ \alpha\ \frac{1}{V^2}$ $\frac{t_2}{t_1} = \frac{{V_1}^2}{{V_2}^2}$ $\frac{t_2}{10} = \frac{230^2}{210^2}$ $t_2 = 11.995\ \approx 12\ min$	1 1 1			99	166-167	1.2m	AO2

5	By Kirchhoff's 1st law: $I = I_1 + I_2 + I_3$ Using $I = \frac{V}{R}$ $\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$ Dividing by V $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$	1 1 1		108	184	1.3e	AO2
6	Increases | Decreases	1		110	180-181	1.4b	AO2
7	$A = \pi r^2$ $= \pi(0.27 \times 10^{-3})^2$ $= 2.29 \times 10^{-7} m^2$ $\rho = \frac{RA}{L}$ $= \frac{18.2 \times 2.29 \times 10^{-7}}{1.25}$ $= 3.33 \times 10^{-6} \Omega\, m$	1 1 1		101	170	1.2l	AO2

8	$\frac{1}{R_{total}} = \frac{1}{2R} + \frac{1}{2R} = \frac{2}{2R}$ $R_{total} = R = 3200\ \Omega$ The voltage across each resistor is $V_{each} = 20\ V$ So the total voltage $= 40\ V$ The total power dissipated is $P_{total} = \frac{{V_{total}}^2}{R_{total}}$ $= \frac{40^2}{3200}$ $= 0.5\ W$	1 1 1 1	Another answer: I through each R $= \frac{V}{R}$ $I = \frac{20}{3200} = 6.25 \times 10^{-3} A$ (1 mark) $I_{total} = 6.25 \times 10^{-3} \times 2$ $= 1.25 \times 10^{-2}$ (1 mark) $V_{total} = 40\ V$ (1 mark) $P_{total} = V_{total} I_{total}$ $= 1.25 \times 10^{-2} \times 40$ (1 mark) $= 0.5\ W$		99	166-167	1.2l 1.2m	AO2
9	$V = \frac{W}{Q}$ $W = VQ$ $W = 12 \times 5.0$ $W = 60\ J$	1 1			98	164	1.2b	AO1
10	From the top loop: $-5 + 2 = -6\ I_2$ $I_2 = 0.5\ A$ From the bottom loop: $5 = 6\ I_2 + 7\ I_3$ Substituting $I_2 = 0.5\ A$ $5 = 3 + 7\ I_3$ $I_3 = 0.29\ A$ $I_1 = I_2 - I_3$ So $I_1 = 0.5 - 0.29$ $I_1 = 0.21\ A$	1 1 1 1 1 1	Another solution: From the outermost loop $2 = 7\ I_3$ (1 mark) $I_3 = 0.29\ A$ (1 mark) From the top loop: $-5 + 2 = -6\ I_2$ (1 mark) $I_2 = 0.5\ A$ (1 mark) $I_1 = I_2 - I_3$ (1 mark) So $I_1 = 0.5 - 0.29$ $I_1 = 0.21\ A$ (1 mark)		106-107	182-183	1.3h	AO2

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دائرة إدارة الامتحانات والاختبارات

11	Capacitor	1		**Capacitance**	233	311	2.1l	AO1
12	8×10^{-6} F	1			231	311	2.1h	AO1
13 **a**	The slope $= \frac{2-3}{2-1}$ $= -1$ $\tau = \frac{-1}{slope} = 1$s $\tau = RC$ $C = \frac{\tau}{R}$ $= \frac{1}{3000}$ $= 3.33 \times 10^{-4} F$	1 1 1 1	** The student can use any two points to find the slope. ** Another solution: Choosing a point from the graph: e.g. (1,3) $In(V_o) = In(V) - \frac{t}{\tau}$ $4 = 3 - \frac{1}{\tau}$ (1 mark) $\tau = 1s$ (1 mark) $\frac{1}{RC} = 1$ $C = \frac{1}{R \times 1}$ $= \frac{1}{3000 \times 1}$ (1 mark) $= 3.33 \times 10^{-4} F$ (1 mark)		231	311	2.1k	AO2
b	$In(V_O) = 4$ $V_o = e^4$ $= 54.6\ V$	1 1			231	310	2.1j	AO2
14	$0.3\ V_1$ | $0.09\ W_1$	1			228	308	2.1f	AO2

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دائرة إدارة الامتحانات والاختبارات

15		Direction of magnetic field	1		**Magnetic fields and electromagnetism**	236	318	3.2b	AO1
16	**a**	$\theta = 90^0 - 60^0 = 30^o$ $F = BILsin30$ $I = \frac{F}{BLsin30}$ $= \frac{0.081}{0.1 \times 2.5 \times sin30}$ $= 0.65A$	1 1 1			241	319	3.2b	AO2
	b	90^o	1			240-241	319	3.2b	AO1
17	**a**	$F = QvBsin90$ $v = \frac{F}{QBsin90}$ $v = \frac{1.2 \times 10^{-15}}{1.6 \times 10^{-19} \times 1.5 \times 10^{-3}}$ $v = 5000000\ ms^{-1}$ **(OR)** $5 \times 10^6\ ms^{-1}$	 1 1			244	329	3.3b	AO2
	b	$F_B = F_E$ $Bvq = Eq$ $v = \frac{E}{B}$	1 1			248	323-324	3.3k	AO2
18		Any two of the following: - Magnetic field strength (B) - Current (I) - Thickness (t) - Charge carrier density (n) - Carrier type - Temperature (T) - Material	2			245	325-326	3.3d	AO1

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دائرة إدارة الامتحانات والاختبارات

19	$r = \frac{mv}{qB}$ $\frac{r_Z}{r_e} = \frac{\frac{5}{4}m_e \times v_e}{e} \times \frac{e}{m_e v_e}$ $= \frac{5}{4} = 1.25$ $r_Z = 1.25 \times r_e$ $= 1.25 \times 6.8 \times 10^{-4}$ $= 8.5 \times 10^{-4}\ m$	1 1 1 1	Another solution: $\frac{r_Z}{r_e} = \frac{m_Z}{m_e}$ $\frac{r_Z}{r_e} = \frac{\frac{5}{4}m_e}{m_e}$ (1 mark) $= \frac{5}{4} = 1.25$ (1 mark) $r_Z = 1.25 \times r_e$ $= 1.25 \times 6.8 \times 10^{-4}$ (1 mark) $= 8.5 \times 10^{-4}\ m$ (1 mark)		246	321	3.3f	AO2
20	Constant | Clockwise	1		**Electromagnetic induction**	254	331	4.1g	AO2
21	$Weber$	1			255	330	4.1a	AO1
22 **a**	$E = \frac{-\Delta(N\Phi)}{\Delta t}$ $-15 \times 10^{-3} = \frac{-\Delta\Phi}{0.1}$ $\Delta\Phi = 15 \times 10^{-3} \times 0.1$ $\Delta\Phi = 1.5 \times 10^{-3}\ wb$	1 1			256-257	332-333	4.1f	AO2

	b	Any three from below: 1- Rate of Change of Magnetic Flux 2- Number of Turns in the Coil 3- Strength of the Magnetic Field 4- Area of the Coil 5- Speed of Relative Motion 6- Angle Between Magnetic Field and Conductor	3			256	333	4.1g	AO1
23		period	1		**Alternating currents**	258	340	5.1a	AO1
24	**a**	Step-up transformer	1			261	336	5.2a	AO1
	b	$\frac{N_s}{N_p} = \frac{V_s}{V_p}$ $\frac{2000}{500} = \frac{V_s}{176.8}$ $V_s = 707.2\ V$	1 1			260-261	344	5.2b	AO1
25	**a**	4.0 V	1			258	341	5.1b	AO1
	b	$V_{r.m.s.} = \frac{V_o}{\sqrt{2}}$ $V_{r.m.s.} = \frac{4.0}{\sqrt{2}}$ $V_{r.m.s.} = 2.8\ V$	1 1	If the used value of the peak voltage is incorrect based on part (a), do not deduce a mark.		260	344	5.1d	AO1
26		268.3 V	1			260	345-347	5.3b	AO2

27	**a**	Full wave rectification **(OR)** Four diodes	1		259	347	5.4e	AO1
	b	A capacitor	1		259	346	5.4g	AO1
	c	t_1 to t_2	1		259	346-347	5.4g	AO1
	d	- Increasing the resistance / Adding resistors in series (1 mark) - Increasing the capacitance / Adding capacitors in parallel (1 mark)	1 1	Give two marks for increasing the time constant (τ).	259	347	5.4g	AO2