College of Sciences
Department of Physics & Astronomy

كلية العلوم
قسم الفيزياء والفلك

Final Exam الامتحان النهائي	40
Academic Year 1444 H – 3rd Semester العام الدراسي ١٤٤٤هـ - الفصل الثالث	

Exam Information معلومات الامتحان			
Course name:	General Physics II	فيزياء عامة - ٢	اسم المقرر:
Course code:	104 PHYS	١٠٤ فيز	رمز المقرر:
Exam date:	Monday 12/06/2023G	الاثنين ١٤٤٤/١١/٢٣هـ	تاريخ الامتحان:
Exam time:	08:00 AM	٠٨:٠٠ صباحاً	وقت الامتحان:
Exam duration:	Three Hours	٣ ساعات	مدة الامتحان:

Student Information معلومات الطالب/ـة		
Student's name:		اسم الطالب/ـة:
Student ID no.:		الرقم الجامعي:
Section no.:		رقم الشعبة:
Roll no.:		رقم التحضير:
Exam room no.:		رقم قاعة الامتحان:
Lecturer's name:		اسم أستاذ/ة المقرر:

The exam consists of 32 QUESTIONS and 7 PAGES (including the cover page and the graph sheet)
All answers are given in MKS (unless the unit is stated)

Physical Constants

$k_e = 9 \times 10^9\ \mathrm{N \cdot m^2 \cdot C^{-2}}$	$\varepsilon_0 = 8.85 \times 10^{-12}\ \mathrm{C^2 \cdot N^{-1} \cdot m^{-2}}$	$\mu_0 = 4\pi \times 10^{-7}\ \mathrm{T \cdot m \cdot A^{-1}}$	$\lvert e \rvert = 1.6 \times 10^{-19}\ \mathrm{C}$
$g = 9.8\ \mathrm{m \cdot s^{-2}}$	$N_A = 6.02 \times 10^{23}\ \mathrm{mol^{-1}}$	$m_e = 9.1 \times 10^{-31}\ \mathrm{kg}$	$m_p = 1.67 \times 10^{-27}\ \mathrm{kg}$

Choose the letter of the correct answer (that fills the gray gap) for the following questions, then write it in CAPITAL LETTER in the appropriate box

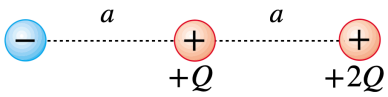
1	2	3	4	5	6	7	8	9	10	11	12
A	C	B	C	A	C	D	B	D	B	D	A

13	14	15	16	17	18	19	20	21	22	23	24
A	B	D	A	C	C	B	D	B	D	A	C

25	26	27	28	29	30	31	32
D	A	D	C	B	A	C	B

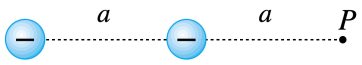
#	Questions (1.25 mark for each)

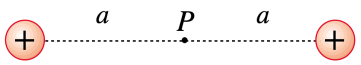
01. Three-point charges are arranged as shown in the figure. If the resultant electric force on the charge $+2Q$ is zero, then the negative charge equals ____.

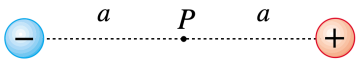


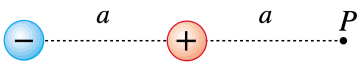
A. $-4Q$ B. $-2Q$ C. $-Q$ D. $-\frac{1}{2}Q$

02. The figures below show four different configurations of point charges all having the same magnitude. The configuration that has the largest electric field at the point P is configuration ____.

A. 

B. 

C. 

D. 

03. If the magnitude of the electric field at a distance r_1 from a line of positive charge of infinite length is E_1, then at distance $r_2 = 2r_1$, the electric field E_2 equals ____.

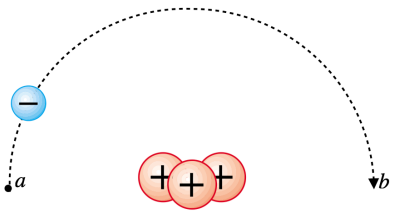
A. $\frac{1}{4}E_1$ B. $\frac{1}{2}E_1$ C. $2E_1$ D. $4E_1$

04. An insulating solid sphere has a uniform volume charge density. The magnitude of its electric field reaches maximum ____.

A. outside the sphere B. inside the sphere

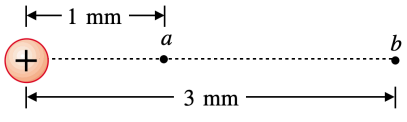
C. at the surface of the sphere D. at the center of the sphere

05. An electron completes half of a circular orbit of radius $r = 2$ nm around a nucleus with charge $Q = +3|e|$, as shown in the figure. As the electron moves from a to b, the change in the electric potential energy equals ____ J.



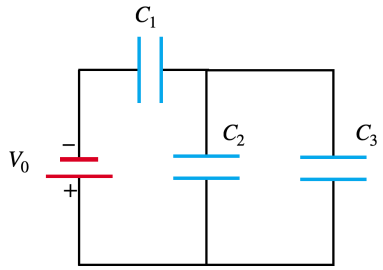
A. 0 B. 3 C. 9 D. 12

06. The figure shows two points near a positive point charge. The ratio, $\frac{V_a}{V_b}$, of the electric potentials at these two points is ____.



A. $\frac{1}{9}$ B. $\frac{1}{3}$ C. 3 D. 9

07. Three capacitors are connected to a battery as shown in the figure, where $C_1 = 15\ \mu F$, $C_2 = 10\ \mu F$, $C_3 = 20\ \mu F$, and $V_0 = 30\ V$. The energy stored in C_2 is _____ μJ.



A. 200 B. 300 C. 450 D. 500

08. A parallel-plate capacitor has a capacitance of 120 pF, a plate area of 100 cm^2, and a mica dielectric ($\kappa = 5.4$) completely filling the space between the plates. If an electric potential difference of 16 V is applied across the capacitor plates, then the magnitude of the electric field in the mica equals _____ kV/m.

A. 2 B. 4 C. 6 D. 8

09. The time it takes for 10^{20} electrons to pass through a point in a wire carrying a 10-A current equals _____ s.

A. 0.2 B. 0.63 C. 1 D. 1.6

10. If the resistance of a 1-m long copper wire that has a radius of 2 mm was found to be 1.35 mΩ, then the resistivity of copper is _____ Ω · m.

A. 0.7×10^{-8} B. 1.7×10^{-8} C. 2.7×10^{-6} D. 107.4×10^{-6}

11. The resistance of a platinum wire increased from 30 Ω at 20.0 °C to 46 Ω when immersed in molten indium. If the temperature coefficient of resistivity for platinum is $3.92 \times 10^{-3}(°C)^{-1}$, then the temperature of the melt is _____ °C.

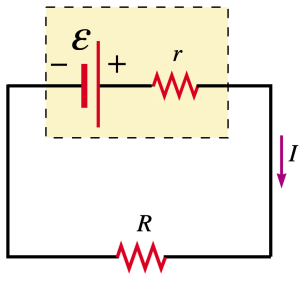
A. 27 B. 93 C. 108 D. 156

12. A potential difference of 220 V is applied to a 44-W lightbulb. The current through the bulb and its resistance are _____.

A. $I = 0.2$ A and $R = 1100\ \Omega$ B. $I = 0.2$ A and $R = 600\ \Omega$

C. $I = 7.3$ A and $R = 1100\ \Omega$ D. $I = 7.3$ A and $R = 600\ \Omega$

13. An 8-Ω resistor is connected to a battery, as shown in the figure. If the battery is labeled with emf of 1.5 V and the battery's internal resistance is 0.30 Ω, then the current in the resistor is _____ A.

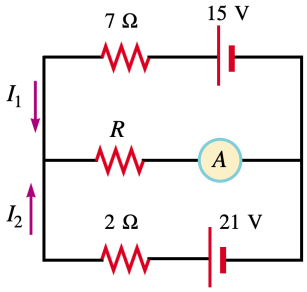


A. 0.18 B. 1.5 C. 12 D. 37

14. A resistor is connected to a battery in a closed circuit. If an additional unknown resistor is connected in parallel to the first resistor, the total current of the circuit will _____.

A. decrease B. increase C. stay the same D. become zero

15. If the ammeter shown in the figure reads 3.00 A, then the unknown resistance R equals _____ Ω.



A. 1 B. 3 C. 4 D. 5

16. In the ***previous question*** (**Q.15**), the current I_1 equals _____ A.

A. 0 B. 1 C. 2 D. 3

17. The unit *tesla* (T) is equivalent to _____.

A. $\mathrm{V/(A \cdot m)}$ B. $\mathrm{V \cdot m/A}$ C. $\mathrm{V \cdot s/m^2}$ D. $\mathrm{V \cdot m/C}$

18. A straight section of the wire is 5 m long and carries a steady current of 2 A in the positive x-*axis* direction. If the magnetic force on the wire was found to be $\mathbf{F} = (-3\hat{\mathbf{j}})$ N, then the magnitude and direction of the magnetic field will be _____.

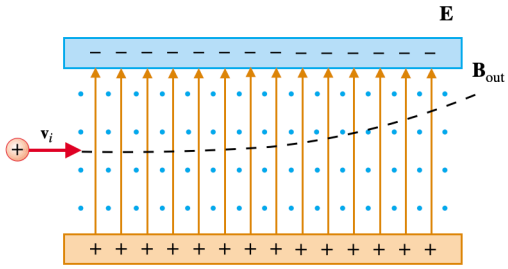
A. $\mathbf{B} = -30\hat{\mathbf{k}}$ T B. $\mathbf{B} = -0.3\hat{\mathbf{k}}$ T C. $\mathbf{B} = +0.3\hat{\mathbf{k}}$ T D. $\mathbf{B} = +30\hat{\mathbf{k}}$ T

19. A particle of charge 2 pC enters a region of uniform magnetic field, $B = 0.2$ μT, perpendicular to the motion of the particle. Then the particle moves in a circle of radius $r = 4$ cm and completes one cycle in 329 ms. The mass of the particle should be _____ $\times 10^{-20}$ kg.

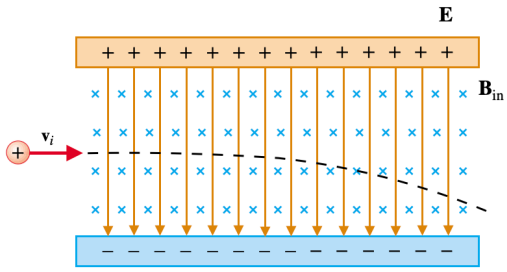
A. 0.13 B. 2.09 C. 33.2 D. 52.6

20. A point charge enters a region of uniform electric and magnetic fields with velocity $v > \frac{E}{B}$. Among the following figures, the correct trajectory of the charge is _____.

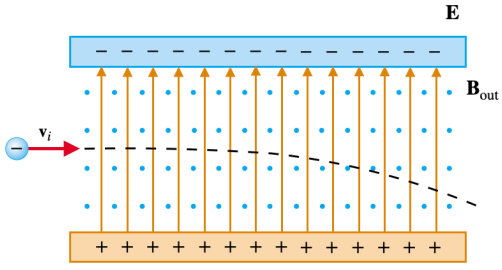
A.



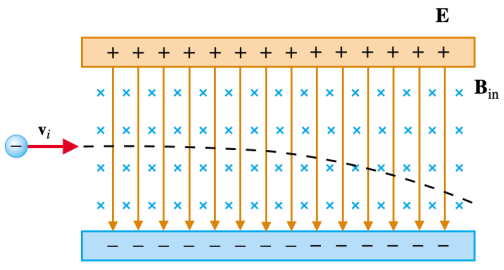
B.



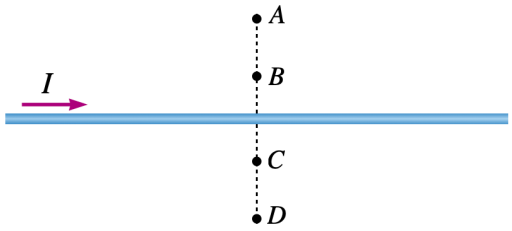
C.



D.

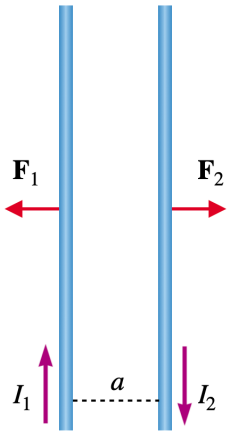


21. For the current carrying wire shown in the figure, the magnitude of the magnetic field coming out from the page is maximum at _____.



A. point A B. point B C. point C D. point D

22. Two parallel wires carrying currents I_1 and I_2 in opposite directions as shown in the figure. If $I_2 = 2I_1$, then _____.



A. $|\mathbf{F}_2| = \frac{1}{2}|\mathbf{F}_1|$ B. $|\mathbf{F}_2| = 2|\mathbf{F}_1|$ C. $|\mathbf{F}_2| = 4|\mathbf{F}_1|$ D. $|\mathbf{F}_2| = |\mathbf{F}_1|$

23. If a 10-cm long solenoid generates a 1.47 mT magnetic field when a current of 1 A is flowing through it, then the number of the solenoid turns should be _____ turns.

A. 117 B. 177 C. 227 D. 277

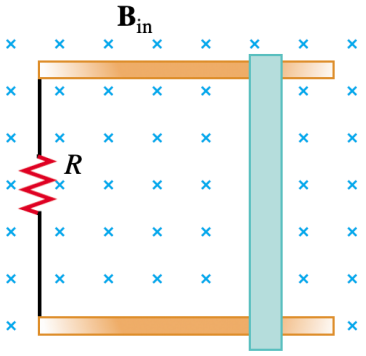
24. The correct mathematical expression for Ampère's law for a closed loop is _____.

A. $\oint \mathbf{B} \cdot d\mathbf{A} = \mu_0 I$ B. $\oint \mathbf{B} \cdot d\mathbf{s} = 0$ C. $\oint \mathbf{B} \cdot d\mathbf{s} = \mu_0 I$ D. $\oint \mathbf{B} \cdot d\mathbf{A} = 0$

25. A 25-cm long coil has a radius of 4 cm and 500 turns is placed in a region where a uniform magnetic field of magnitude 0.04 T makes an angle of 37° with the axis of the coil. Am emf of _____ V will be induced if the magnetic field steadily reduces to zero in 0.2 s.

A. 0.1 B. 0.2 C. 0.3 D. 0.4

26. A conducting bar of length 10 cm moves on two frictionless conducting parallel rails connected to a resistance (R) in the presence of a uniform 0.6-T magnetic field directed into the page, as shown in the figure. If the bar moves to the right with a constant speed of 2.5 m/s, then the induced emf equals _____ V.



A. 0.15 B. 0.24 C. 0.42 D. 20

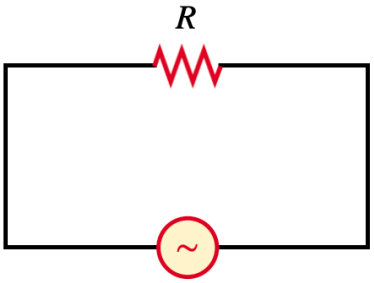
27. If the current changes uniformly from 0 to 6 A in 3 μs in a solenoid ($L = 2 \times 10^{-5}$H), the self-induced emf of the solenoid, is ____.

A. 20 V, in the same direction of the current
B. 20 V, in opposite direction to the current
C. 40 V, in the same direction of the current
D. 40 V, in opposite direction to the current

28. The magnetic field in a solenoid of cross-sectional area 10^{-4} m^2 and length of 1 cm is 3 μT. The total energy stored in the solenoid is ____ pJ.

A. 1.2
B. 1.7
C. 3.6
D. 7.1

29. As shown in the circuit, a sinusoidal voltage $\Delta v(t) = 200\sin(377t)$, where t is in seconds and Δv is in volts, is connected to a resistor ($R = 425\ \Omega$). The current in the AC circuit is ____.



A. $i(t) = 0.47\sin(377t + \pi/2)$
B. $i(t) = 0.47\sin(377t)$
C. $i(t) = 0.47\sin(377t - \pi/2)$
D. $i(t) = 0.47\cos(377t)$

30. In the ***previous question*** (**Q.29**), the average power delivered to the resistor equals ____ W.

A. 47
B. 94
C. 100
D. 200

31. An inductor has a 54 Ω reactance at 60.0 Hz. The reactance of the inductor at 50.0 Hz equals ____ Ω.

A. 27.0
B. 32.4
C. 45.0
D. 64.8

32. An AC power source (with adjustable frequency and constant voltage amplitude) is applied to a series RLC circuit. If the frequency of the source is increased in the circuit, then ____.

A. the inductive reactance decreases
B. the capacitive reactance decreases
C. the inductance increases
D. the capacitance decreases

"Wish you success and a bright future" ...