Faculty of Computers & Artificial Intelligence

1st Term (January 2020) Final Exam
Level: 1st level **Major:** General
Course Code: BS121
Subject: Physics

Benha University

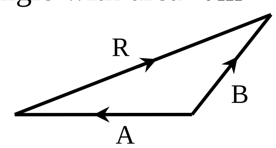
Date: 04 / 01 /2020
Time: 2 Hours
Total Marks: 50 Marks
Examiner(s): Dr. Salah Hamza

نموذج إجابة مادة/ الفيزياء **د صلاح عيد إبراهيم حمزة**

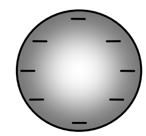
الفرقة الأولي حاسبات (مادة كامله) **ت/ 04 / 01 /2020**

Choose the correct answer and shaded its circle in the answer sheet.

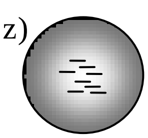
1. The magnitude of two vectors $\vec{A}$ and $\vec{B}$ are 12 units and 8 units. The largest and smallest values for the resultant vector $\vec{R} = \vec{A} + \vec{B}$ are: (a) 14.4 and 8 (b) 10 and 5 (c) 20 and 4.
2. In SI system of units, the units of Coulomb constant k_e is (a) Nm^2C^{-2} (b) $Nm^{-2}C^2$ (c) $Nm^{-2}C^{-2}$
3. The flux of a constant electric field of $5\,NC^{-1}$ in the z-direction through a rectangle with area $4\,m^2$ in the xy-plane. (a) $20\,Nm^2C^{-1}$ (b) $10\,Nm^2C^{-1}$ (c) $0\,Nm^2C^{-1}$



4. From the figure, the value of the resultant vector is (a) $R = A + B$ (b) $R = A - B$ (c) $R = B - A$
5. Object A has a charge of $2\mu C$, and object B has a charge of $6\mu C$. Which statement is true? (a) $\vec{F}_{AB} = -3\vec{F}_{BA}$ (b) $\vec{F}_{AB} = -\vec{F}_{BA}$ (c) $3\vec{F}_{AB} = -\vec{F}_{BA}$



6. The material of the sphere in the figure is (a) insulator (b) conductor (c) semiconductor
7. The units of the electric field E is (a) NC^{-2} (b) NC^2 (c) NC^{-1}
8. The units of the Coulomb's constant k_e are (a) NC^{-2} (b) Nm^2C^{-2} (c) NC^{-1}
9. The magnitude of the electric force F between charges q_1 and q_2 separated by a distance r is given by: (a) $Fr = k_e q_1 q_2$ (b) $Fr^2 = k_e q_1 q_2$ (c) $F = k_e q_1 q_2 r^2$
10. The units of the electric flux Φ_E are (a) NmC^{-1} (b) Nm^2C^{-1} (c) NC^{-1}
11. Which of the following is incorrect: (a) $\underline{\nabla} \cdot \underline{E} = \rho / \varepsilon_o$ (b) $\underline{\nabla} \cdot \underline{D} = \rho$ (c) $\underline{\nabla} \cdot \underline{D} = \rho / \varepsilon_o$
12. The first Maxwell equation in electrostatics is: (a) $\underline{\nabla} \cdot \underline{E} = \rho / \varepsilon_o$ (b) $\underline{\nabla} \times \underline{D} = \rho$ (c) $\underline{\nabla} \cdot \underline{D} = \rho / \varepsilon_o$
13. The resultant value of $\underline{\nabla} \cdot \underline{D}$ is: (a) vector quantity (b) scalar quantity (c) no answer
14. The charge density ρ of $\underline{D} = xy^2\hat{i} + yx^2\hat{j} + z\hat{k}$ is: (a) $x + y + 1$ (b) $y^2 + x^2 + 1$ (c) $y^2 + x^2 + \hat{k}$
15. The charge density ρ of $\underline{D} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ is: (a) $x + y + z$ (b) $y^2 + x^2 + z^2$ (c) $2(x + y + z)$



16. The material of the sphere in the figure is (a) insulator, (b) conductor (c) semiconductor
17. The differential form of Gauss's law is: (a) $\underline{\nabla} \cdot \underline{D} = \rho$ (b) $\underline{\nabla} \times \underline{D} = \rho$ (c) $\underline{\nabla} \cdot \underline{D} = \sigma$
18. The radial component of the operator $\underline{\nabla}$ in cylindrical coordinates is: (a) $\partial / \partial r$ (b) $\partial / r\partial\theta$ (c) $\partial / \partial z$
19. The radial component of $\underline{\nabla} \cdot \underline{D}$ is: (a) $\partial / \partial r(rD_r)$ (b) $r^{-1}\partial / \partial r(rD_r)$ (c) $\partial / \partial z(rD_z)$
20. The volume charge density ρ of the field $\underline{D} = \hat{r}$ is: (a) $1/r$ (b) $r^{-1}\partial / \partial r(rD_r)$ (c) $\partial r(rD_r)$
21. The electric field lines in Fig 1 satisfy the relation: (a) $\underline{\nabla} \cdot \underline{E} = \rho$ (b) $\underline{\nabla} \cdot \underline{E} = \rho / \varepsilon_o$ (c) $\underline{\nabla} \cdot \underline{E} = 0$
22. The electric field lines in Fig 2 satisfy the relation: (a) $\underline{\nabla} \cdot \underline{E} = \rho$ (b) $\underline{\nabla} \cdot \underline{E} = \rho / \varepsilon_o$ (c) $\underline{\nabla} \cdot \underline{E} = 0$

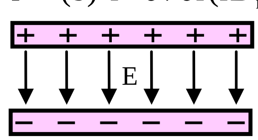


Fig. 2

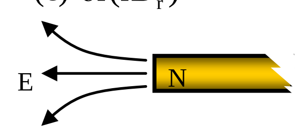
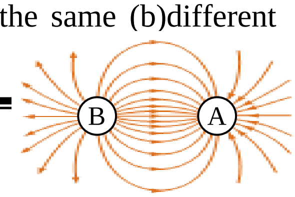


Fig. 1

23. The z-component of $\underline{\nabla} \cdot \underline{D}$ in Cartesian and cylindrical coordinates are: (a)the same (b)different (c)no answer



24. The charge "A" in Fig. 3 is (a) positive (b) negative (c) no answer
25. The charge "B" in Fig. 3 is (a) positive (b) negative (c) no answer
26. The electric flux Φ_E is given by (a) EA (b) E/A (c) A/E
27. The electric flux Φ_E is given by (a) $q_{in}\varepsilon_o$ (b) q_{in}/ε_o (c) ε_o/q_{in}
28. The electric flux through the surface in Fig. 4 is: (a) $-3/\varepsilon_o$ (b) $3/\varepsilon_o$ (c) $-6/\varepsilon_o$

Fig. 3

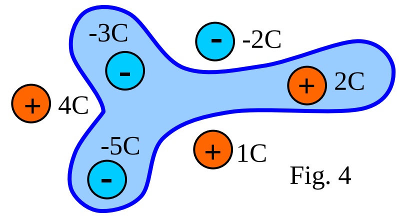


Fig. 4

- A spherical conducting shell of inner radius "a" and outer radius "b" carries a total charge "$+Q$" distributed on its surface (Fig.5).

29. The electric flux at $r = a$ is (a) 0 (b) Q (c) Q/ε_o
30. The electric flux at $r = b$ is (a) 0 (b) Q (c) Q/ε_o

- If an additional charge of $-2Q$ is placed at the center (Fig. 6).

31. The electric flux at $r = a$ is (a) 0 (b) $-Q/\varepsilon_o$ (c) $-2Q/\varepsilon_o$
32. The electric flux at $r = b$ is (a) 0 (b) $-Q/\varepsilon_o$ (c) $-2Q/\varepsilon_o$

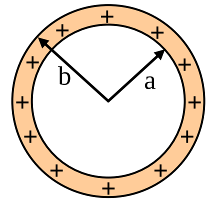


Fig. 5

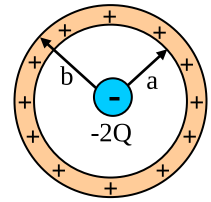


Fig. 6

33. From Fig. 7, the electric field at "a" is (a) 0 (b) $\sigma/2\varepsilon_o$ (c) σ/ε_o
34. From Fig. 7, the electric field at "b" is (a) 0 (b) $\sigma/2\varepsilon_o$ (c) σ/ε_o
35. The electric field E at a distance r from a charge q is (a) Fq, (b) q/F (c) F/q
36. In Fig. 8, the electric field at "a" is (a) 0 (b) $\sigma/2\varepsilon_o$ (c) σ/ε_o
37. In Fig. 8, the electric field at "b" is (a) 0 (b) $\sigma/2\varepsilon_o$ (c) σ/ε_o
38. In Fig. 8, the electric field at "c" is (a) 0 (b) $\sigma/2\varepsilon_o$ (c) σ/ε_o

Fig. 7

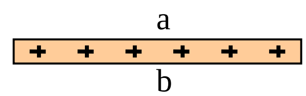
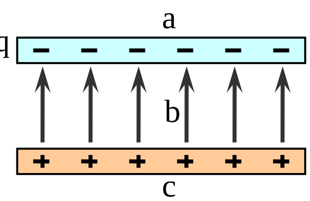


Fig. 8



- Figure 9 shows a charged particle "q" moving in a magnetic field "B". The magnetic force F_B is always directed toward the center of the circle and a centripetal force F_c is upward the center. Then,

39. The angular velocity "ω" is (a) r/υ (b) υ/r (c) υr
40. The magnetic force F_B is (a) $q\upsilon B$ (b) $m\upsilon^2/r$ (c) qBr
41. The centripetal force F_c is (a) $q\upsilon B$ (b) $m\upsilon^2/r$ (c) qBr
42. The radius of the path "r" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
43. The velocity of the particle "υ" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
44. Chose the correct equation (a) $mr = q\upsilon B$ (b) $mB = qBr$ (c) $m\upsilon = qBr$
45. The angular velocity of the particle "ω" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
46. The periodic time "T" can be calculated from (a) qBr/υ (b) $qB\upsilon/2\pi r$ (c) $2\pi m/qB$
47. The mass of the particle "m" can be calculated from (a) qBr/υ (b) $qB\upsilon/2\pi r$ (c) $B\upsilon r/q$

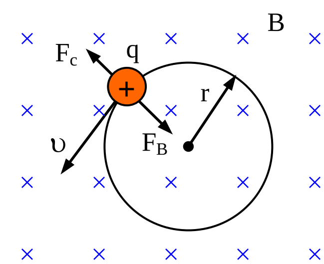


Fig. 9

- Proton of charge $q = 1.6\times10^{-19}\,C$ and mass $m = 1.67\times10^{-27}\,Kg$ move in a circular orbit with radius $2\,cm$ under the effect of a magnetic field intensity $2\,T$. Then

48. The proton angular frequency is (a) $2.92\times10^3\,s^{-1}$ (b) $9.2\times10^5\,s^{-1}$ (c) $1.92\times10^7\,s^{-1}$
49. The proton velocity in its orbit is (a) $8.83\times10^6\,m/s$ (b) $3.83\times10^5\,m/s$ (c) $33.8\times10^4\,m/s$
50. The time required for one com0plete revolution is (a) $0.237\times10^{-6}\,s$ (b) $0.237\times10^{-5}\,s$ (c) $0.27\times10^{-8}\,s$

GOOD LUCK

Prof. Dr. Salah Hamza