

Dhaka, Dinajpur, Sylhet-2018

Physics Second Paper (Creative)

Sub Code :

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Time: 2Hrs 35 min

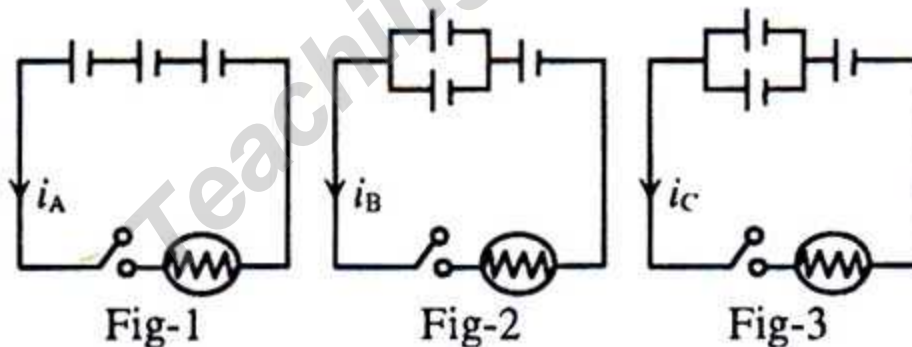
Full marks: 50

[Read the following stems and answer any five of the following questions:]

1. ★ Ratio of absorbed and dumped heat of a heat engine is 5.2 and by increasing 110K the efficiency becomes 70%. Engine absorbs 1200J heat from source.

- What is paraelectric constant?
- Voltage is equal at center and surface of charged round sphere-explain.
- Find the efficiency of engine.
- How can the engine be changed to a Carnot's engine by keeping the source temperature unchanged- Explain.

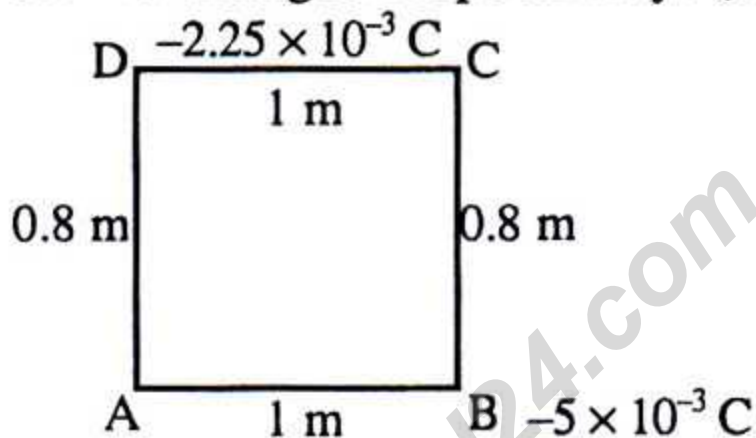
2. ►



Fariha took three same electric cells and an electric bulb to make three circuits like shown in the figure above. [Internal resistance of the cell is $0.1\ \Omega$ and resistance of the bulb is negligible.]

- What is specific resistance?
- Kirchhoff's first law follows the conservation law of charge. Explain.

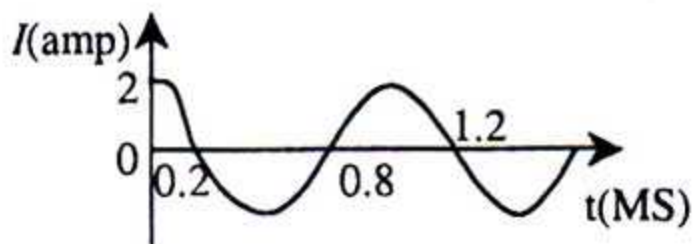
- c. If the electric current is $I_A = 10 \text{ A}$ after the switch is turned on then determine E ?
- d. After the switch is turned on what will be the condition of the bulb in figures 2 and 3? Explain mathematically.
3. **★** At points B and D of ABCD square there are $+5 \times 10^{-3} \text{ C}$ and $-2.25 \times 10^{-3} \text{ C}$ charges respectively. (air medium)



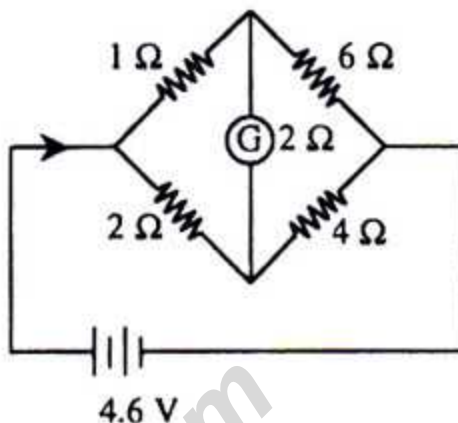
- a. What is angular magnification?
- b. What do you understand by- "Heat coefficient of tungsten is $4.25 \times 10^{-3} \text{ }^\circ\text{C}$ "?
- c. Determine intensity at point A.
- d. If A and C are connected together with a metal conductor than from which direction positive charge will flow? Explain mathematically.
4. **►** In Young's double slit experiment a light of wavelength 5000 \AA is exposed to the slits which are 0.1 mm apart. The screen is placed 2m away from the slits.
- a. What is dispersion of light? 1
- b. Is the deviation of light depends on the prism angle? Explain. 2
- c. Find the distance of the 10th maximum from the central maximum. 3

- d. Compare with mathematical analysis between the angular position of 10th maximum and 10th minimum. 4

5. ►



1st Fig

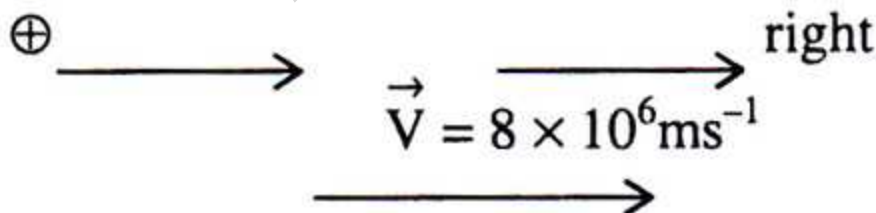


2nd Fig

Rafi says magnetic amplitude of 1st fig is enough for 2nd figure. But, Shafi says required current for 2nd figure is equal to mean value of 1st figure.

- What is mutual inductance?
- Write physical importance of Lenz's law.
- Write down current flow for 1st figure after $6.8\mu\text{s}$.
- Who is correct-explain.

6. ► Proton $\vec{E} = 4 \times 10^5 \text{NC}^{-1}$

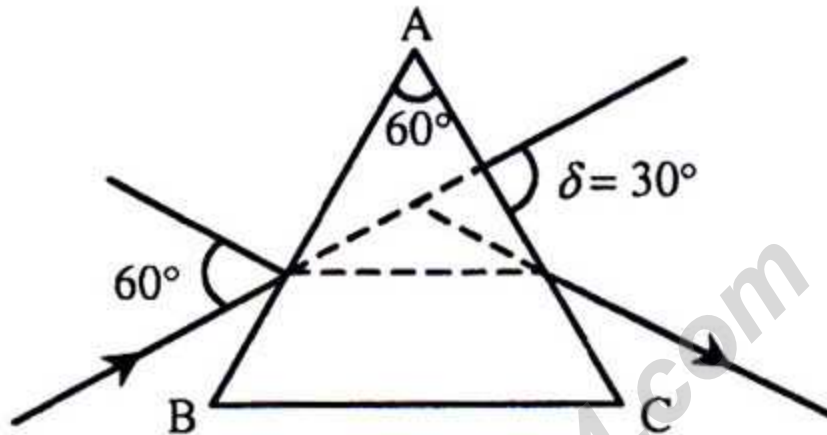


Later a magnetic field of 0.50T is applied on the moving proton directed perpendicularly downward to the page.

- Write the Lenz's law. 1
- Why an ammeter is connected in series on the position by the magnetic field? 2

- c. Calculate the value of force imposed on the proton by the magnetic field. 3
- d. Mathematically analyze the path of the proton after the magnetic field is applied. 4

7. ★



- a. What is hall voltage?
- b. Why do we need specific source for interference of light?
- c. What is the refractive index of prism?
- d. What type of change must be brought to incident angle to result in minimum angle of deviation-explain mathematically.
8. ► A Galaxy (X) is receding from our Galaxy Milkyway with velocity 1000 km^{-1} . There is a black hole of with a mass of $5 M_0$. [Hubble's constant, $H = 2.3 \times 10^{-18} \text{ s}^{-1}$, $M_0 = 1.99 \times 10^{30} \text{ kg}$, $C = 3 \times 10^8 \text{ ms}^{-1}$, 1 light year = $9.46 \times 10^{12} \text{ km}$.]
- a. Define dark matter. 1
- b. Differentiate white dwarf and Nemeses mar in time of Chandrasekhat hast. 2
- c. Determine the distance at X Galaxy in term of light year. 3
- d. Verify whether any light ray can pass 12km far from black hole. 4

1. Half-life and mean life are mutually —

- (a) directly proportional
- (b) inversely proportional
- (c) equal
- (d) double

2. If the frequency of yellow, orange and red light are ν_y , ν_o and ν_r respectively, then which relation of the following is correct?

- (a) $\nu_r > \nu_o > \nu_y$
- (b) $\nu_y > \nu_o > \nu_r$
- (c) $\nu_o > \nu_y > \nu_r$
- (d) $\nu_o > \nu_r > \nu_y$

3. **Hall voltage**—

i. $V_H = Bvd$

ii. $V_H = \frac{Bl}{ntq}$

iii. $V_H \propto E$

Which one is correct?

- (a) i
- (b) i and ii
- (c) ii and iii
- (d) i, ii, and iii

4. How many digit in decimal number system?

- (a) 2
- (b) 8
- (c) 10
- (d) 16

5. What is the nature of radio telescope?

- (a) Absorber
- (b) Disperser
- (c) Reflective
- (d) Refractive

6. The work for which a post office box is used—

- (a) bill collection in post office
- (b) to determine the electromotive force of a cell
- (c) to determine the unknown resistance of conductor
- (d) to determine the current of a circuit

7. The resistance of a wire is 2Ω . Keeping the material same, if the length of the wire is doubled, then what will be the new resistance?

- (a) 1 ohm
- (b) 2 ohm
- (c) 3 ohm
- (d) 4 ohm

8. The specific resistance of a wire depends on—

- i. the length of the wire
- ii. the temperature of the wire
- iii. the material of the wire

Which one is correct?

- (a) i
- (b) ii

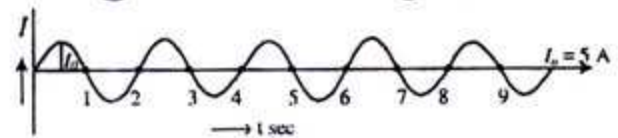
- (c) ii and iii
- (d) i, ii, and iii

9. The fundamental elements of geomagnetism is—

- (a) 2
- (b) 3
- (c) 4
- (d) 5

10. What time the mass of a supernova with respect to the mass of the sun?

- (a) 2
- (b) 3
- (c) 4
- (d) 5



Answer questions no. 11 and 12 according to the above figure—

11. **What is the effective value of current?**

- (a) $5\sqrt{2}$ A
- (b) $\frac{5}{\sqrt{2}}$ A
- (c) $\frac{\sqrt{5}}{2}$ A
- (d) $\frac{\sqrt{5}}{2}$ A

12. The angular frequency of the wave is —

- (a) 4π
- (b) 3π
- (c) 2π
- (d) π

13. If the refractive index $\mu > 1$, the —
 i. the light ray passing through the denser medium to rarer medium
 ii. the light ray passing through the rarer medium to the denser medium
 iii. incident angle will be greater than refractive angle.

Which one is correct?

- (a) i and ii
- (b) i and iii
- (c) ii and iii
- (d) i, ii, and iii

14. The half life of three radioactive elements A, B and C are T_A , T_B and T_C respectively and their decay constants are λ_A , λ_B and λ_C respectively [Here, $\lambda_A > \lambda_B > \lambda_C$]
 Which relation of the following is correct?

- (a) $T_C > T_B > T_A$
- (b) $T_B > T_A > T_C$
- (c) $T_C > T_A > T_B$
- (d) $T_A > T_B > T_C$

Input	Output	
X	Y	P
0	0	1
0	1	0
1	0	0
1	1	0

For which gate the truth table is applicable?

- (a) OR (b) XOR
(c) NOR (d) NAND

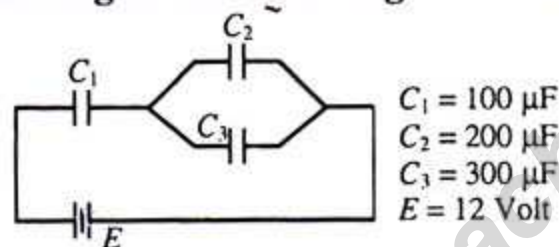
16. The ratio of two molar specific heat of a gas is constant. This constant is indicated by the symbol—

- (a) λ (b) R
(c) γ (d) K

17. Number of stars in the galaxy in which we live—

- (a) 10^{10} (b) 10^{14}
(c) 10^{12} (d) 10^{13}

Answer the questions on 18 and 19 according to the following circuit.—



18. What is the equivalent capacitance of the circuit?

- (a) $8.33 \times 10^{-6} \text{ F}$
(b) $83.3 \times 10^{-6} \text{ F}$
(c) $833.3 \times 10^{-6} \text{ F}$
(d) $8333.3 \times 10^{-6} \text{ F}$

19. The ratio of the stored energy of the circuit of the stem and the stored energy of the capacitors when they are connected in parallel—

- (a) 7.2:1 (b) 1:7.2
(c) 5:6 (d) 0.13:1

20. The unit of mechanical equivalent

of heat is —

- (a) caloric/gram
(b) joule/calorie
(c) calorie/joule
(d) joule-calorie

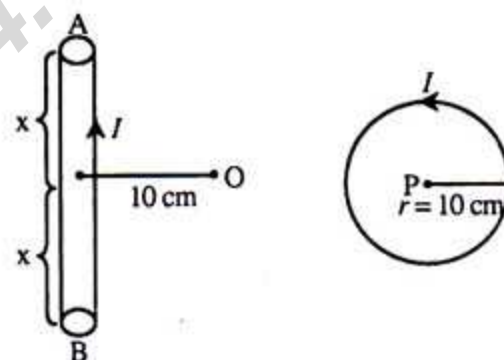
21. If the phase difference of two points of a wave is 3π , then the path difference is—

- (a) $\frac{\lambda}{2}$ (b) λ
(c) $\frac{3\lambda}{2}$ (d) 2λ

22. What is the speed of a Rocket when the length of the Rocket will be one-fourth of its initial length?

- (a) $3 \times 10^8 \text{ ms}^{-1}$
(b) $2.99 \times 10^8 \text{ ms}^{-1}$
(c) $2.92 \times 10^8 \text{ ms}^{-1}$
(d) $2.90 \times 10^8 \text{ ms}^{-1}$

23.



What is the ratio of the magnetic field created in O and P?

- (a) 31.4 (b) 3.14
(c) 0.314 (d) 0.0314

$$\begin{aligned}
 \text{N. B. } \frac{B_a}{B_p} &= \frac{\mu_0 I}{2\pi \times 10} \times \frac{2 \times 10}{\mu_0 I} \\
 &= \frac{1}{\pi} = 0.318
 \end{aligned}$$

24. Who gives the formula $E_\lambda \propto T^4$?

- (a) Rayleigh-Jeans
(b) Planck
(c) Stefan
(d) Wein

25. $2 \text{ amu} = ?$

- (a) 1863 MeV (b) 1863 eV
(c) 931.5 MeV (d) 931.5 eV

Ans.	1	(a)	2	(b)	3	(d)	4	(c)	5	(c)	6	(c)	7	(d)	8	(c)	9	(a)	10	(a)	11	(b)	12	(d)	13	(c)
	14	(a)	15	(c)	16	(c)	17	(b)	18	(b)	19	(d)	20	(b)	21	(c)	22	(d)	23	*	24	(c)	25	(a)		