

Chattogram Board-2017

Physics Second Paper (Creative)

Sub Code :

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Time: 2Hrs 35 min

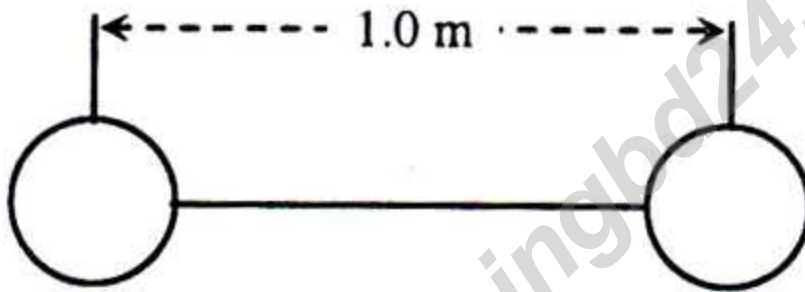
Full marks: 50

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

1. ▶ A Carnot engine receives 1400 J heat from a 510K emitter and releases 800 J heat.

- What is the zero formula of thermodynamics? 1
- What is the universal death of heat? 2
- Find the efficiency of the engine. 3
- For its efficiency to be 54%, what changes are needed? 4

2. ★ The two-dot charges are in air medium.

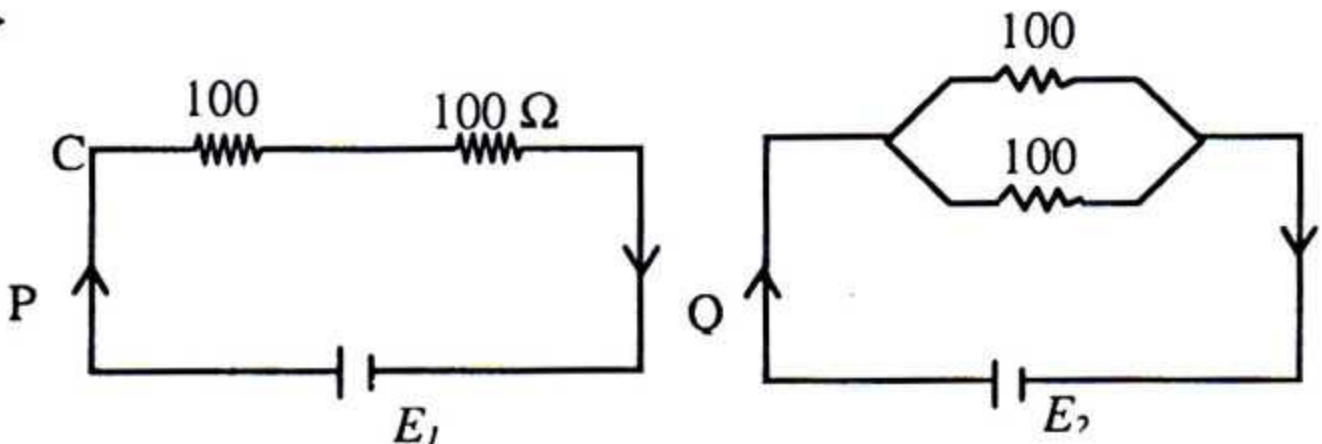


$$A = -20 \times 10^{-6} \text{ C}$$

$$B = -40 \times 10^{-6} \text{ C}$$

- What is doping? 1
- The potential energy of Earth is zero- Explain. 2
- What is the Coulomb force between the charges? 3
- At which point between the charges is the electric intensity zero? Calculate your answer. 4

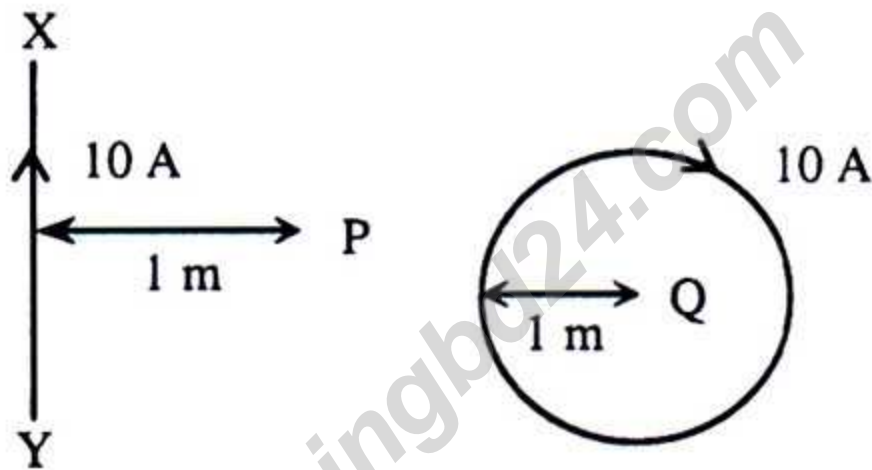
3. ▶



P and Q are two circuits, where the wire's length is 0.5m and radius is 0.2m. Current is being flowed between them for the same amount of time.

- a. What is 1 eV? 1
- b. The work done by movement of charges on a plane of the same potential energy is zero- Explain. 2
- c. Find the resistance of the wires from the stem. 3
- d. For an equal amount of heat to be produced in P and Q, will electromotive force E_1 be greater than E_2 ? 4

4. ★



- a. What is Hall Effect? 1
- b. What does “Dhaka’s deviation is 31° ” mean? 2
- c. Find the value of magnetic field at point P caused by XY wire. 3
- d. “The magnetic field of either P or Q is greater than the other”- Justify the statement. 4

5. ► The curvature radius of a lens is 20cm and 40cm. If an object is placed 60cm away from the lens, an image is formed 48cm behind the lens. The lens is then placed in a liquid with a refractive index of 1.67.

- a. What is Coherent source? 1
- b. Why can't light escape from black holes? 2

- c. Find the refractive index of the lens. 3
- d. What is the nature of the lens after it is immersed in liquid? 4
6. ▶ Two electrons are moving with 0.866 C and 0.99 C velocity. The mass of electrons is 9.1×10^{-31} kg.
- a. What is work function? 1
- b. If the velocity of electron and proton is equal, why is the De Broglie wavelength of the electron higher? 2
- c. Find the dynamic mass of the first electron? 3
- d. The kinetic energy of the first electron is less than the second electron- Explain. 4
7. ▶ ${}_{92}\text{U}^{235} + {}_0\text{n}^1 \rightarrow [{}_{92}\text{U}^{236}]^* \rightarrow {}_{56}\text{Ba}^{141} + {}_{36}\text{Kr}^{92} + \text{Neutron} + \text{Energy}$
- Here, ${}_{92}\text{U}^{235} = 236.0526$ a.m.u, ${}_{56}\text{Ba}^{141} = 140.9139$ a.m.u, ${}_{36}\text{Kr}^{92} = 91.8973$ a.m.u and ${}_0\text{n}^1 = 1.0087$ a.m.u, $\frac{T_1}{2} = 450 \div 10^8$ Y.
- a. What is nucleon? 1
- b. The total energy of the electrons in a molecule is always negative- Explain. 2
- c. How many neutrons will be released in the reaction above? 3
- d. How much energy is released from the reaction? 4
8. ▶ A closed coil with 100 cm^2 average area and 200 torsions is perpendicular to a magnet of 0.2×10^{-4} tesla. It is rotated 180° in $\frac{1}{10}$ s- % 180° .
- a. What is a semiconductor? 1
- b. How is the magnetic nature of matter created naturally? 2
- c. What is the average value of the electromotive force of the coil? 3
- d. If the coil is moved 360° with the same velocity, how will the current flow change? 4

1. $I = \sin \omega t$ What is the peak value?

- (a) 0 A (b) 0.5 A
(c) 1.0 A (d) 2.0 A

2. **★** In reverse bias current, what is in the semiconductor?

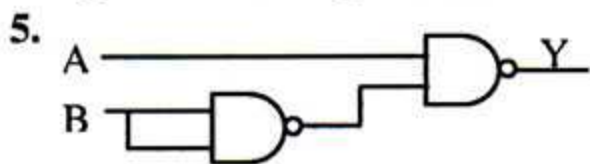
- (a) Just holes
(b) Just electrons
(c) Both electron and holes
(d) Just ions.

3. How much time is needed for AC current to reach peak value from point zero? (T = Time period)

- (a) $\frac{T}{4}$ (b) $\frac{T}{2}$
(c) $\frac{3T}{4}$ (d) T

4. Who provided the electromagnetic theory of light?

- (a) Max Planck (b) Maxwell
(c) Einstein (d) Newton



What is the output of the logic gate?

- (a) $\bar{A}B$ (b) $A\bar{B}$
(c) $A + \bar{B}$ (d) $\bar{A} + B$

6. If the speed of light is c , which is correct?

- (a) $c = \sqrt{\epsilon_0 \mu_0}$ (b) $c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$
(c) $c = \sqrt{\frac{\epsilon_0}{\mu_0}}$ (d) $c = \sqrt{\frac{\mu_0}{\epsilon_0}}$

7. **★** What is the minimum angular momentum of hydrogen molecules?

- (a) h (b) $\frac{h}{2}$
(c) $\frac{h}{2\pi}$ (d) $\frac{2\pi}{h}$

8. Which thermodynamic law was thermometer built on?

- (a) Zero (b) First
(c) Second (d) Joule

9. Thermodynamic variables are—

- i. Pressure ii. Heat
iii. Volume

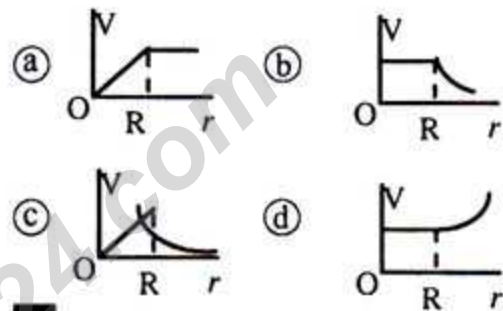
Which is correct?

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

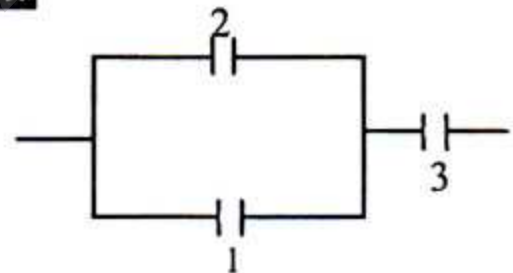
10. How many isothermal expansions are there of a Carnot engine?

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

11. Which graph is applicable for indicating the change of potential energy as the distance increases from a charged sphere's centre? (R = Radius of sphere)



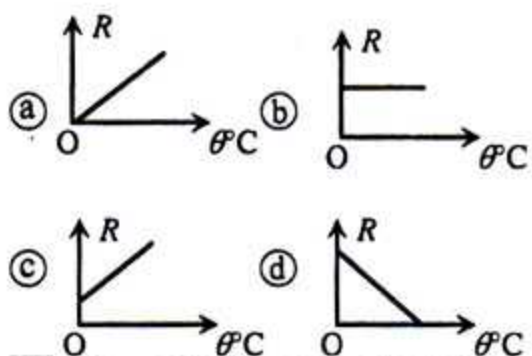
12. **★**



What is the total capacitance?

- (a) $6.0 \mu\text{F}$ (b) $4.5 \mu\text{F}$
(c) $1.5 \mu\text{F}$ (d) $0.67 \mu\text{F}$

13. Which graph indicates the change of capacitance with the change of temperature?



14. **★** In minimum deviation of a prism,—

- i. $r_1 = r_2$ ii. $i_1 = i_2$
iii. $\delta_m = 2(i_1 - r_1)$

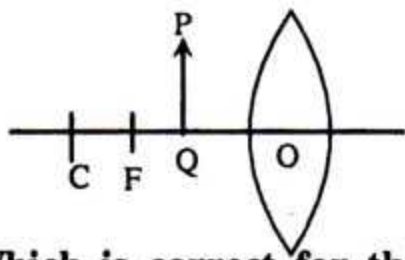
Which is correct?

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

15. Neutron number of ${}_{92}\text{U}^{235}$ is-

- (a) 92 (b) 143
 (c) 235 (d) 327

16.



Which is correct for the image of PQ?

- (a) Real, upside down and shorter
 (b) Real, upside down and longer
 (c) Unreal, right side up and shorter
 (d) Unreal, right side up and longer

17. The focus distance of the objective and eyepiece is 40 cm and 5 cm. What is the magnification power for focusing at infinity?

- (a) 45 cm (b) 35 cm
 (c) 8 (d) 0.12

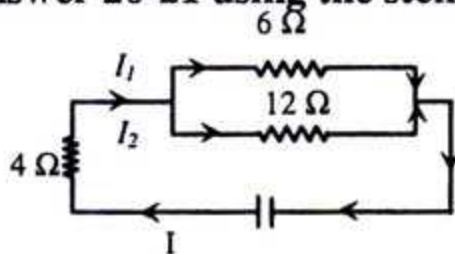
18. Whose theory is-"the location and momentum at the same time of a particle is uncertain"?

- (a) Heisenberg (b) Newton
 (c) Isaac (d) Maxwell

19. ★ Which is Ishwar particle?

- (a) Photon (b) Gluon
 (c) Lepton (d) Higgs boson

Answer 20-21 using the stem:



20. What is the total resistance?

- (a) 2 Ω (b) 8 Ω
 (c) 12 Ω (d) 16 Ω

21. Which is correct for current flow?

- (a) $I_2 < I_1 < I$ (b) $I_1 < I_2 < I$
 (c) $I_2 < I < I_1$ (d) $I < I_1 < I_2$

Answer 22-23 using the stem:

On one space there is a 4 Ω resistor and on the other space there is a 6 Ω resistor of a meter bridge.

22. What is the distance of the antinode from 6 Ω?

- (a) 10 cm (b) 40 cm
 (c) 60 cm (d) 90 cm

23. To get the antinode exactly in the center, which resistor should we add with 6Ω?

- (a) 12 Ω series.
 (b) 12 Ω parallel
 (c) 2 Ω series
 (d) 2 Ω parallel

24. ★ If 2A current is flowed through a 1 m radius wire, what is the value of the magnetic field in the center?

- (a) μ_0 (b) $\frac{\mu_0}{2}$
 (c) $\frac{\mu_0}{\pi}$ (d) $\frac{\mu_0}{2\pi}$

25. The elements of the Earth's magnet are-

- i. Declination
- ii. Deviation
- iii. Horizontal component of geographical magnet

Which is correct?

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