

Rajshahi Board-2017

Physics Second Paper (Creative)

Sub Code :

1	7	5
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Time: 2Hrs 35 min

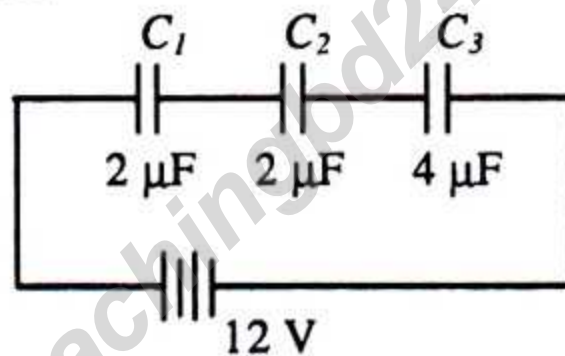
Full marks: 50

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

1. ► A cylinder has some gas trapped inside it. In 300 Pa pressure where 600 J heat is slowly applied, the work done by the system is 900 J.

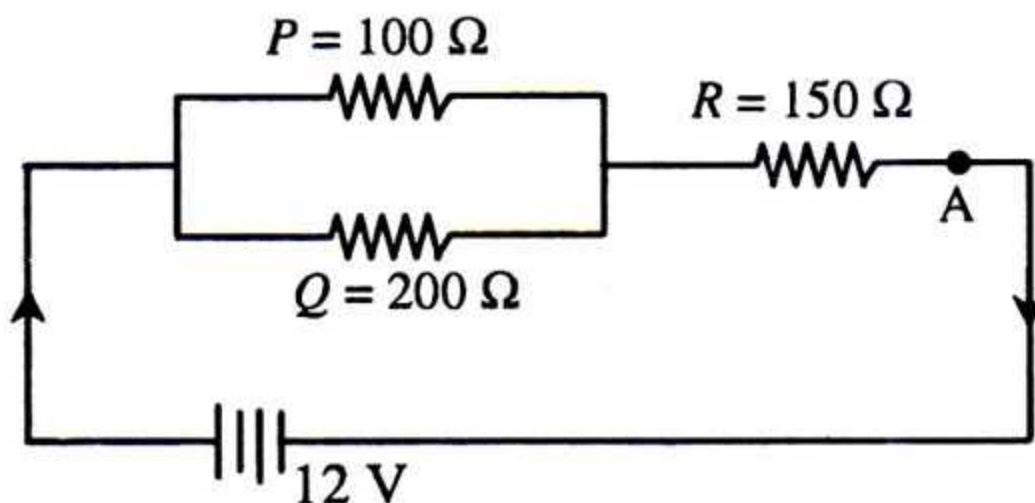
- a. What is the efficiency of a heat engine? 1
- b. In adiabatic compression, why does the internal energy of the system increase? 2
- c. Find the change of the volume of gas. 3
- d. According to this stem, the law of conservation of energy is preserved- Explain. 4

2. ★ This is a circuit:

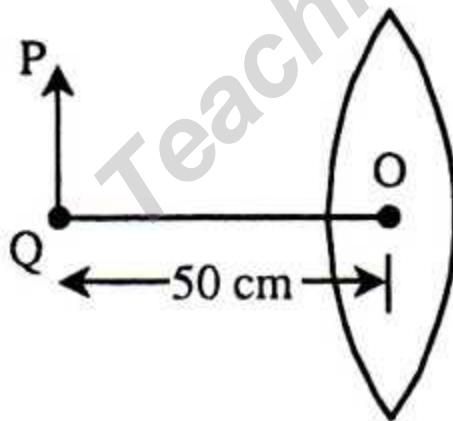


- a. What is a capacitor? 1
- b. What is series connection? 2
- c. What is the stored energy? 3
- d. To get maximum stored energy, how should we change the circuit? 4

3. ►



- a. What is charge quantization? 1
 - b. What is voltage loss? 2
 - c. Find electric flow at A. 3
 - d. Removing which resistance will let us obtain maximum flow? Explain. 4
4. ★ Sayem is working with a coil in the lab. In a 500 twist coil, he flows 2.5 A current and finds 2×10^{-2} Wb change in magnetic flux. He assumes that if current flows for 2 sec in the coil, he will attain 8V electric energy.
- a. What is Lorentz energy? 1
 - b. The magnetic field of a coil is 15T- Explain. 2
 - c. Find the induction coefficient of the magnet. 3
 - d. Justify his assumption. 4
5. ►



$$\begin{aligned} \mu_g &= 1.5 \\ \mu_w &= 1.3 \\ r_1 &= 20 \text{ cm} \\ r_2 &= 30 \text{ cm} \end{aligned}$$

- a. What is Optical Center? 1
- b. What does -2.5 D mean? 2
- c. What is the focus distance? 3
- d. If it is placed in air, then water, how will the image change? Explain. 4

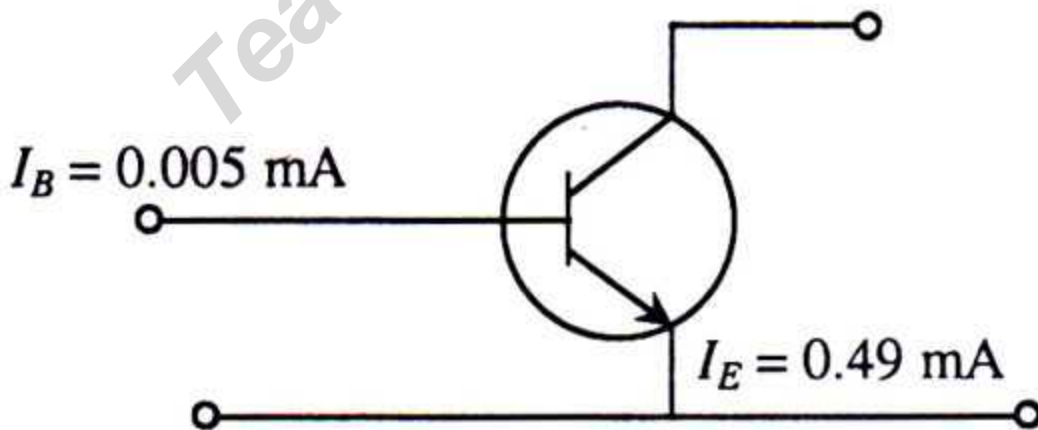
6. ► Karim discussed various subjects of relativity with Rahim. Karim said that an astronaut went with $2.5 \times 10^8 \text{ m.s}^{-1}$ velocity when he was 30 years old to another planet. The length of the rocket on Earth was 80 m.

- What is supernova? 1
- Explain Einstein's relativity of time. 2
- How will the length of the rocket change? 3
- If the astronaut returns as a 50 year old, will his age be correct according to Earth's calendars? Explain. 4

7. ★ The corrosion constant of tritium is $5.54 \times 10^{-2} \text{ y}^{-1}$.

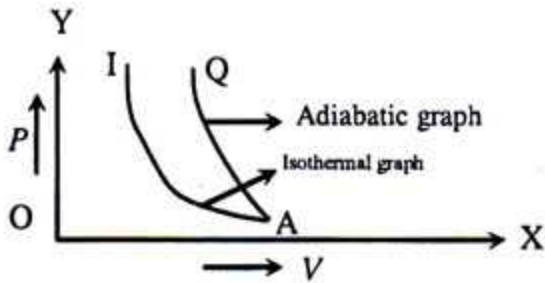
- What is chain reaction? 1
- The half-life of radium is 3.82 days- Explain. 2
- How much time is needed for the tritium to decay 70%? 3
- The average life of tritium is greater than its half-life- Explain. 4

8. ►



Answer the questions using the figure.

- What is P-type diode? 1
- What effect does doping have in current flow? 2
- Find the value of α . 3
- Can we make an amplifier circuit using the transistor? 4



Use the graph to answer question 1-2:

1. For AQ graph, which is correct?

- (a) $PV = \text{constant}$
- (b) $PV^\gamma = \text{constant}$
- (c) $PV^{\gamma-1} = \text{constant}$

(d) $PV^{\frac{1-\gamma}{\gamma}} = \text{constant}$

2. If the gas is hydrogen, how many times steeper would AQ be than AI?

- (a) 1.1
- (b) 1.33
- (c) 1.4
- (d) 1.66

3. For electrons, which is correct?

- i. Negative charge
- ii. Positive charge
- iii. Has mass

Which is correct?

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

Read the stem and answer 4-5:

The distance of the charges of an electric dipole is 10^{-10} cm. 3 cm away from its centre, the electric field intensity is $3 \times 10^{-6} \text{ d.C}^{-1}$

4. What is the charge of the dipole?

- (a) $9 \times 10^{-9} \text{ C}$
- (b) $4.5 \times 10^{-9} \text{ C}$
- (c) $3 \times 10^{-9} \text{ C}$
- (d) $1.5 \times 10^{-9} \text{ C}$

5. From the centre to 3cm away at the pole of the dipole, the electric field intensity is how many times of the previous intensity?

- (a) Double
- (b) Equal
- (c) Half
- (d) One fourth

6. Which is the unit of electron flow?

- (a) Coulomb
- (b) Volt
- (c) Ampere
- (d) Siemens

7. Which is the formula of Lorentz force?

(a) $\vec{F} = q\vec{E} + q\vec{V} \times \vec{B}$

- (b) $\vec{F} = q\vec{E}$
- (c) $\vec{F} = q\vec{V} \times \vec{B}$
- (d) $\vec{F} = qvB \sin \theta \hat{n}$

8. When a light ray enters another medium from air, its momentum decreases by 15%.

- (a) 1.18
- (b) 1.21
- (c) 1.33
- (d) 1.50

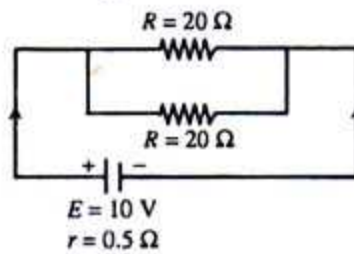


Fig-1

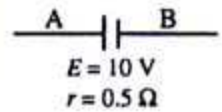


Fig-2

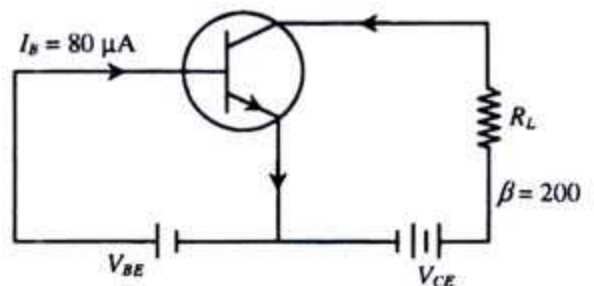
Note the diagram and answer 9-10:

9. What is the electric flow in fig 1?

- (a) 0.95 A
- (b) 0.9524 A
- (c) 1 A
- (d) 1.05 A

10. If AB cell from fig-2 is connected in parallel, then the heat formed in the outer resistance R_p is-

- (a) 8.523 W
- (b) 9.518 W
- (c) 9.75 W
- (d) 10 W



11. What is the value of α ?

- (a) 0.67
- (b) 0.80
- (c) 1.5
- (d) 2.0

Note: Answer: 0.995

12. What is the formula of event horizon radius?

- (a) $R_S = \frac{2GM}{c^2}$
- (b) $R_S = \frac{GM}{c^2}$
- (c) $R_S = \frac{GM}{2c^2}$
- (d) $R_S = \frac{c^2}{2GM}$

13. **★** IF a 2D and 3D lens are in contact, then-

- i. Total lens power is 5D
- ii. Their total focus distance is 0.2m
- iii. The magnification power of the 2nd lens is 1.75

Which is correct?

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

14. Which particle has zero mass?

- (a) Electron (b) Photon
- (c) Proton (d) π -Meson

15. The mass error of a nucleus is 0.0377 amu. What is its bond strength?

- (a) 31.2 MeV (b) 32.5 MeV
- (c) 33.1 MeV (d) 35.11 MeV

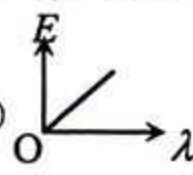
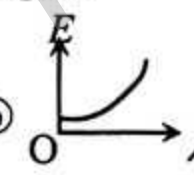
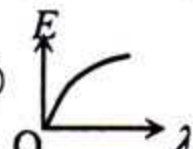
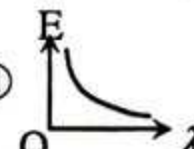
16. What is the unit of dielectric constant?

- (a) $C^2.d^{-1}.m^{-2}$ (b) $C^2.d^{-2}.m^{-1}$
- (c) No unit (d) $N^{-1}.m^{-2}$

17. Which serial is correct for light and wavelength?

- (a) $\lambda_R > \lambda_Y > \lambda_V$ (b) $\lambda_R < \lambda_Y < \lambda_V$
- (c) $\lambda_V > \lambda_R < \lambda_Y$ (d) $\lambda_Y > \lambda_R < \lambda_V$

18. What is the graph of photon energy vs. wavelength?

- (a)  (b) 
- (c)  (d) 

19. S_2 is moving from stationary structure S_1 at $\frac{C}{3}$ ms^{-1} speed. If S_1 dissipates light, then what will be the speed of light to S_2 ?

- (a) $\frac{C}{3} m.s^{-1}$ (b) $(c - \frac{C}{3}) m.s^{-1}$

- (c) $(c + \frac{C}{3}) m.s^{-1}$ (d) $c m.s^{-1}$

20. The radius of molecules is-

- (a) $10^{-15} m$ (b) $10^{-10} m$
- (c) $10^{-15} cm$ (d) $10^{-10} cm$

21. Which isn't a unit to measure radioactivity?

- (a) Curie (b) Becquerel
- (c) Rutherford (d) Rontgen

22. **★** Trying to limit the frequency of light is-

- (a) Reflection
- (b) Refraction
- (c) Polarization
- (d) Waves

23. Of AC current-

i. Highest value is called amplitude

ii. The total value of a cycle is zero

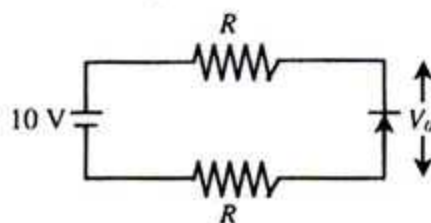
iii. Effective value of a cycle is $\frac{1}{\sqrt{2}}$

times the peak value

Which is correct?

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

24. Value of V_0 in the diode is-



- (a) 0 (b) 10 V
- (c) 5 V (d) R dependent

25. For a dipole NPN junction transistor to work, the polarity of electrodes is-

- (a) Collector(+ve), base(-ve)
- (b) Collector(-ve), base(+ve)
- (c) Collector(-ve), base(-ve)
- (d) Collector(+ve), base(+ve)

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