

ICSE Board
Class X Physics

Time: 2 hrs

Total Marks: 80

General Instructions:

1. *Answers to this paper must be written on the paper provided separately.*
 2. *You will **not** be allowed to write during the first **15** minutes. This time is to be spent in reading the question paper.*
 3. *The time given at the head of the paper is the time allotted for writing the answers.*
 4. *Attempt **all** questions from **Section I** and **any four** questions from **Section II**.*
 5. *The intended marks of questions or parts of questions are given in brackets [].*
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Section 1 (40 Marks)

Attempt *all* questions from this section.

Question 1

[10]

- (a) What do you mean by equilibrium of a body?
- (b) Define the term energy and state its SI unit.
- (c) State the principle of conservation of energy.
- (d) Give two reasons why the efficiency of a single movable pulley is not 100%.
- (e) A ray of light is normally incident on one face of an equilateral glass prism. What is the
i. Angle of incidence on the first face of the prism
ii. Angle of refraction from the first face of the prism

Question 2

[10]

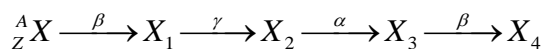
- (a) Out of red light, violet light, yellow light and green light, which light has the maximum shift?
- (b) Name two factors which affect the critical angle for a given pair of media. State how these factors affect it.
- (c) What do you mean by focal plane of the lens?
- (d) What do you understand by the term spectrum?
- (e) State Faraday's law of electromagnetic induction.

Question 3**[10]**

- (a) State two differences between light and sound.
- (b) State the condition for resonance to occur.
- (c) State three factors which effect the loudness of a sound heard by a listener.
- (d) Name the three factors on which the resistance of a wire depends and state how is it affected by the factors stated by you.
- (e) State how are the two resistors joined with a battery in each of the following cases when
 - i. the same current flows in each resistor
 - ii. the potential difference is the same across each resistor

Question 4**[10]**

- (a) What are the factors on which heat energy absorbed by a body depends?
- (b) Define the term latent heat.
- (c) State the medical use of radioactivity.
- (d) What is Einstein's mass energy equivalence?
- (e) Complete the following nuclear changes.

**Section 2 (40 Marks)****Attempt *any four* questions from this section.****Question 5****[10]**

- (a) i. Define moment of force and state its SI unit.
 - ii. A mechanic can open a nut by applying a force of 150 N while using a lever handle of length 40 cm. How long a handle is required if he wants to open it by applying a force of only 50 N?
- (b) A body of mass 1 kg initially at rest is moved by a horizontal force of 0.5 N on a smooth frictionless table. Calculate the work done by the force in 10 s and show that this is equal to the change in kinetic energy of the body.
- (c) Derive the relationship between mechanical advantage, velocity ratio and efficiency.

Question 6**[10]**

- (a) i. For the same angle of incidence, the angle of refraction in three media is 15° , 25° and 35° , respectively. In which medium will the velocity of light be minimum?
ii. What is the cause of refraction of light?
- (b) i. An object 10 cm long is placed at 15 cm from a convex lens of focal length 10 cm. Find the position and size of the image.
ii. The focal length of a lens is (1) positive (2) negative.
In each case, state the kind of lens.
- (c) i. Which colour of white light travels (a) the fastest and (b) the slowest in glass?
ii. State three differences between ultraviolet, visible and infrared waves.

Question 7**[10]**

- (a) i. What are the frequencies of the notes produced in an open and closed end pipe?
ii. The wavelength of sound emitted by a source is $1.7 \times 10^{-2} \text{ m}$. ms^{-1}

Calculate the frequency of sound if its velocity is 343.4.

- (b) i. When a troop crosses a suspension bridge, soldiers are asked to break their steps. Why?
ii. How can the frequency of vibration of a stretched string be increased?
- (c) i. What is meant by loudness of sound? On what factor does the loudness of sound depend?
ii. Explain the term pitch of a sound. On what factor does the pitch of sound depend?

Question 8**[10]**

(a) A resistance of 6 ohm and an electric toy motor of resistance 20 ohm are connected in series with a 12-V battery.

- (i) Draw the circuit.
(ii) Find the total resistance of the circuit.
(iii) Find the total current of the circuit.

(b) Which type of circuit (series/parallel) would you use to decorate a Christmas tree and for light fittings in house. Write reasons for your choice.

- (c) i. Name any two factors on which the strength of the magnetic field produced by a current-carrying solenoid depends. How does it depend on these factors?
ii. Write some of the important uses of electromagnets.

Question 9**[10]**

(a) i. What is a calorimeter?

ii. Name the material it is made of. Give the reason behind using these materials.

(b) i. State two differences between heat capacity and specific heat capacity.

ii. A refrigerator converts 100 g of water at 20°C to ice at -10°C in 73.5 min. Calculate the average rate of heat extraction in watt. The specific heat capacity of water is $4.2 Jg^{-1}K^{-1}$, specific latent heat of ice is 336 and specific heat capacity of ice is $2.1 Jg^{-1}K^{-1}$.

(c) A piece of ice of mass 40 g is added to 200 g of water at 50°C. Calculate the final temperature of water when all the ice has melted. Specific heat capacity of water = $4200 JKg^{-1}K^{-1}$ and specific latent heat of fusion of ice = $336 \times 10^3 Jkg^{-1}$.

Question 10**[10]**

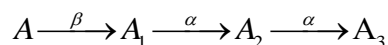
(a) Define the following terms:

i. α -particle

ii. β -particle

iii. γ -rays

(b) i. A radioactive nucleus undergoes a series of decays according to the sequence:



If the mass number and atomic number of A_3 are 172 and 69, respectively, what is the mass number and atomic number of A?

ii. If 200 MeV energy is released in the fission of a single nucleus of ${}_{92}U^{235}$. How many fissions must occur per second to produce a power of 1kWh.

(c) i. In a nuclear fusion reaction, the loss in mass is 0.4%. How much energy is released in the fusion of 1 kg mass?

ii. Why is nuclear fusion not possible at ordinary temperature and pressure?