

# VIBGYOR HIGH

## Third Preliminary Examination

2020-2021

PHYSICS

~~SCIENCE~~ Paper - 1

Grade: X

Max. Marks : 80

Date : 15.03.2021

Time Allowed: 2 hours

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*Answers to this Paper must be written on the paper provided separately.*

*You will **not** be allowed to write during the first **15 minutes**.*

*This time is to be spent in reading the Question Paper.*

*The time given at the head of this Paper is the time allowed for writing the answers.*

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**Section I** is compulsory. Attempt any four questions from **Section II**.

The intended marks for the questions or parts of questions are given in brackets [ ].

This paper contains **8** printed pages.

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### SECTION – I (40 Marks)

Attempt **all** questions from this Section.

- |           |   |             |
|-----------|---|-------------|
| <b>Q1</b> |   | <b>[10]</b> |
| a         | State two factors affecting the turning effect of a body.   | [2]         |
| b         | Express 5 kWh into joule.   | [2]         |
| c         | With reference to the term mechanical advantage, velocity ratio and efficiency of a machine, name and define the term that will not change for a machine of given design. | [2]         |
| d         | The wavelength of X-rays is $0.01 \text{ \AA}$ . Calculate its frequency. State the assumption made, if any.  | [2]         |

- e (i) Calculate the minimum distance at which a person should stand in front of a reflecting surface so that he can hear a distinct echo. (Take speed of the sound in air = 350 m/s). [2]
- (ii) State the use of echo in medical field.

**Q2** [10]

- a A body is acted upon by two forces each of magnitude  $F$ , but in opposite directions. State the effect of forces if: [2]
- (i) Both the forces act at the same point of the body.
- (ii) The two forces act at two different points of the body at a separation  $r$ .
- b Find the kinetic energy of a body of mass 1 kg moving with a uniform velocity of  $10 \text{ ms}^{-1}$ . [2]
- c What is the velocity ratio of a single fixed pulley? How does friction in the pulley bearing affect it? [2]
- d Define forced vibration and resonant vibration. [2]
- e Explain why does a wine glass start rattling, when a note of some particular frequency is struck by piano? [2]

**Q3** [10]

- a It takes 20 s for a person A of mass 50 kg to climb up the stairs, while another person B of same mass does the same in 15 s. Compare the [2]
- (i) work done, and
- (ii) power developed by the persons A and B.
- b Two isosceles right angled glass prism are placed near each other as shown in the figure. Complete the path of the ray entering the [2]

first isosceles right angled glass prism till it emerges from the second identical prism.



- c Define focal Length. If a lens is placed in water instead of air, how does its focal length change. [2]
- d Can a concave lens form an image of size two times that of the object? Give reason. [2]
- e
- (i) How does the angle of minimum deviation produced by a prism change with increase in the wavelength of incident light? [2]
- (ii) The nucleus  ${}_{84}\text{X}^{202}$  emits an alpha particle and forms the nucleus Y. Represent this change in the form of an equation.

**Q4** [10]

- a State two similarities between the  $\gamma$  - rays and X - rays. [2]
- b 1300 J of heat energy is supplied to raise the temperature of 0.5 kg of lead from  $20^\circ\text{C}$  to  $40^\circ\text{C}$ . Calculate the specific heat capacity of lead. [2]
- c A convex lens forms an image 16 cm long of an object 4 cm long kept at a distance 6 cm from the lens. The object and the image are on the same side of lens. [2]
- (i) What is the nature of image?

- (ii) Find the position of image.
- d (i) Define the term power of a lens. [2]
- (ii) Write a relation between the angle of incidence (i), angle of emergence (e), angle of prism (A) and angle of deviation (d) for a ray of light passing through an equilateral prism.
- e An electric bulb is rated at '100 W, 250 V'. What information does it convey? [2]

### SECTION II (40 Marks)

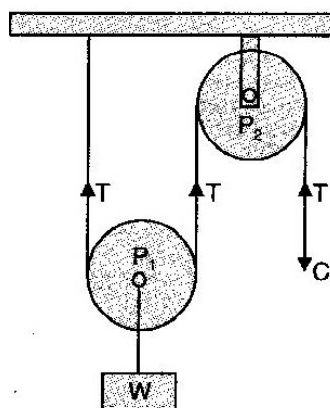
*Attempt any **four** questions from this Section.*

**Q5** [10]

- a A uniform meter rule rests horizontally on a knife edge at the 60 cm mark when a mass of 10 g is suspended from one end.
- (i) Draw a diagram of the arrangement. [1]
- (ii) Find the mass of the meter rule. [2]
- b A pendulum is oscillating on either side of its rest position. Explain the energy changes that takes place in the oscillating pendulum. How does the mechanical energy remain constant in it? Draw the necessary diagram. [3]
- c (i) Define heat capacity and state its S.I. unit. [2]
- (ii) 1 kg of ice at 0 °C is heated at constant rate and its temperature is recorded after every 30 s till steam is formed at 100 °C. Draw a temperature time graph to represent the change of phase. [2]

**Q6** [10]

- a The diagram shows the combination of two pulleys  $P_1$  and  $P_2$  used to lift up a load  $W$ .



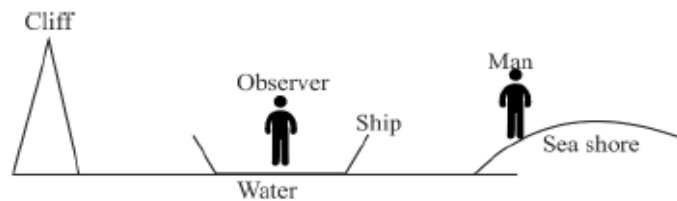
- (i) State the kind of pulleys  $P_1$  and  $P_2$ . [1]
- (ii) State the function of the pulley  $P_1$ . [1]
- (iii) What effort  $E$  has to be applied at  $C$  to just raise the load  $W = 20$  kgf? Neglect both the weight of the pulley  $P_1$  and friction. [1]

- b An iron ball of mass  $0.2$  kg is added into  $0.5$  kg of water at  $10^\circ\text{C}$ . The resulting temperature is  $30^\circ\text{C}$ . Calculate the temperature of hot ball. (specific heat capacity of iron as  $336$  J/kg K) [3]

- c A lens forms an erect, magnified, and virtual image of an object.
- (i) Name the kind of lens. [1]
  - (ii) Draw a ray diagram to show the formation of image. [2]
  - (iii) Name the device which uses this principle. [1]

**Q7** [10]

- a
- (i) What is total internal reflection? [1]
  - (ii) The speed of light in air is  $3 \times 10^8$  m s<sup>-1</sup>. Calculate the speed of light in glass. The refractive index of glass is  $1.5$ . [2]
- b A person is standing at the sea shore. An observer on the ship, which is anchored in between a vertical cliff and the person on the shore, fires a gun. The person on the shore hears two sounds,  $2$  seconds and  $3$  seconds after seeing the smoke of the fired gun. If the speed of sound in the air is  $320$  ms<sup>-1</sup> then calculate: [3]



- (i) the distance between the observer on the ship and the person on the shore.
- (ii) the distance between the cliff and the observer on the ship.
- c A wave has wavelength just shorter than  $4 \times 10^{-7}$  m.
  - (i) Name the wave. [1]
  - (ii) State one way of detecting these waves. [1]
  - (iii) Mention two uses of it. [2]

**Q8**

**[10]**

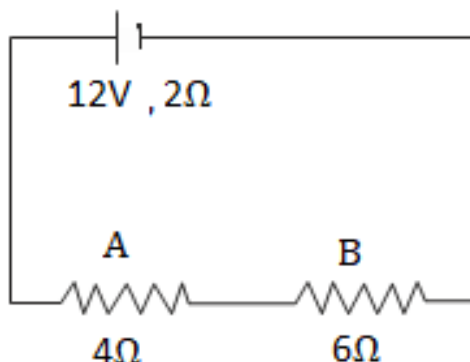
- a What device other than a plane mirror, can be used to turn a ray of light by  $180^\circ$ ? Draw a diagram in support of your answer. Name an instrument in which this device is used. [3]
- b A voltage source sends a current 2.5 A to a resistor of  $20 \Omega$  connected across it for 5 minutes. Calculate:
  - (i) The potential difference of the source. [1]
  - (ii) The electrical energy supplied by the source, and [1]
  - (iii) The heat in calorie, produced in the resistor. [1]
- c
  - (i) Name the material used for (a) filament of an electric bulb and (b) heating element of a room heater. [2]
  - (ii) Two wires, one copper and other of iron are at the same length and same radius. Which will have more resistance? Give reason. [2]

**Q9**

**[10]**

- a A battery of e.m.f. 12 V and internal resistance  $2 \Omega$  is connected with two resistors A and B of resistance  $4 \Omega$  and  $6 \Omega$  respectively

joined in series.



Find :

- (i) The current in the circuit, [1]
- (ii) The potential difference across 6 Ω Resistor, [1]
- (iii) Electrical energy spent per minute in 4 Ω resistor. [1]

b Mention any three safety precautions to be taken while handling electrical appliances. [3]

- c (i) What is a fuse? [1]
- (ii) Name the material of fuse. [1]
- (iii) State two characteristics of material used for fuse. [2]

## Q10 [10]

- a "A uniform circular motion is an accelerated motion".  
Answer the following questions:
  - (i) Explain the statement. [1]
  - (ii) Name the force responsible to cause this acceleration. [1]
  - (iii) What is the direction of force at any instant? [1]
- b A pulley system has a velocity ratio 3 and an efficiency of 80%.  
Draw a labelled diagram of this pulley system. Calculate the M.A. [3]
- c (i) 'Radioactivity is a nuclear phenomenon'. Comment on this statement. [2]

(ii) State any two-medical uses of radioactivity.

[2]

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