THE FIRST COMPARATIVE EXAMINATION 2022-23

CLASS X (ICSE)

PHYSICS

SCIENCE Paper – 1

Time: Two hours **Maximum marks: 80**

Instructions:

* *Answers to this paper must be written on the answer script 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.*
* *All subsections of each question must be answered in the correct order.*
* *Please **do not** write anything on the question paper except your name and roll number.*
* *The intended marks for questions or parts of questions are given in brackets [ ].*
* ***Section I** is compulsory. Attempt any **four** questions from **Section II**.*

SECTION I [40 marks]

*Attempt **all** questions from this section.*

Question 1

(a) Calculate the height through which a body of mass 0.5 kg is lifted if the energy spent in doing so is 2 J. [Take $g = 10\ m\ s^{-2}$] [2]

(b) State the condition when the work done by a force is [2]

(i) positive (ii) negative.

(c) How is the kinetic energy of a moving cart affected if its velocity is reduced to $\frac{1}{3}$ rd of the initial velocity? [2]

(d) What physical quantity does the electron volt (eV) measure? How is it related to the S.I. unit of that quantity? [2]

(e) State the energy changes in the following cases while in use: [2]

(i) Loudspeaker (ii) Washing machine.

Question 2

(a) Derive the relationship between the S.I. and C.G.S units of moment of force. [2]

(b) State two conditions for a body, acted upon by several forces, to be in equilibrium. [2]

(c) A light mass and a heavy mass have equal momentum. Which will have more kinetic energy? Give reason. [2]

(d) A coin is placed at the bottom of a beaker containing water at the depth of 15 cm. The refractive index of water is 4/3. Calculate the height through which the image of the coin is raised. [2]

(e) A ray of light passes from one transparent medium to another. How do the following quantities change if the second medium is denser than the first? [2]

(i) Wavelength (ii) Frequency.

Question 3

(a) (i) For which colour of white light, the refractive index of a transparent medium is least?

(ii) The wavelength of the light of red and blue colours are nearly 7.8×10^{-7} m and 4.8×10^{-7} m respectively. Which colour has greater speed in vacuum? [2]

(b) State two conditions necessary for total internal reflection to occur. [2]

(c) Velocity of light in air is 3×10^{8} m s^{-1}. Calculate the velocity of light in diamond of refractive index 2.5. [2]

(d) (i) Define critical angle.

(ii) Which colour of light red or green, has a higher critical angle? [2]

(e) Draw a ray diagram to show the appearance of a stick partially immersed in water. [2]

Question 4

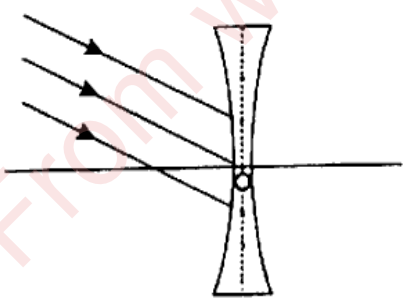
(a) (i) State the condition for a rigid body to show translational motion when a force is applied on it.

(ii) What type of motion is exhibited by a freely falling body? [2]

(b) (i) What is the position of centre of gravity of a hollow cylinder?

(ii) State the factor on which the position of centre of gravity of a body depends. [2]

(c) Copy and complete the following ray diagram. Label the focus by letter F. [2]



(d) Focal length of a concave lens is 20 cm. Calculate and express its power with sign. [2]

(e) State one application each of a convex and a concave lens. [2]

SECTION II [40 marks]

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

Question 5

(a) (i) Define moment of force. [1]

(ii) A spanner has a long handle. Why? [2]

(b) An uniform metre scale can be balanced at 70 cm mark, when a mass of 0.05 kg is hung from 94 cm mark. [3]

(i) Draw a diagram of the arrangement.

(ii) Find the mass of the metre scale.

(c) (i) Name and define the principle on which beam balance works [2]

(ii) Is it possible to have an accelerated motion with a constant speed? Name such type of motion. [2]

Question 6

(a) A ray of light is incident normally on one face of an equilateral glass prism. Answer the following: [3]

(i) What is the angle of incidence on the first face of prism?

(ii) What will be the angle of incidence on the second face of prism?

(iii) Will the light ray suffer minimum deviation by the prism?

(b) Is it possible to burn a piece of paper using a convex lens in day light without using a match box or any direct flame? Draw a ray diagram to support your answer. [3]

(c) A convex lens forms an erect and three times magnified image of an object placed at a distance 10 cm in front of it. Find: [4]

(i) the position of image.

(ii) the focal length of lens.

Question 7

(a) (i) What is meant by dissipation of energy? [1]

(ii) A ball of mass 50 g is thrown vertically upwards with an initial velocity of 20 m s^{-1}. Calculate the energy dissipated if it has potential energy of 6 J at the maximum height.($g = 10$ m s^{-2}) [2]

(b) Show with the help of a diagram how a total reflecting prism (45°, 90°, 45°) can be used to turn a ray of light through 90°. Name one instrument in which such a prism is used. [3]

(c) (i) Fill in the blanks: [4]

(A) 1 kWh = _____ MJ (B) 1GJ = _____ J

(ii) The work done by a fielder when he takes a catch in a cricket match is negative. Explain.

Question 8

(a) (i) Define optical centre of a thin lens. [1]

(ii) Distinguish between a real and a virtual image. [2]

(b) A monochromatic light ray is refracted through an equilateral prism kept in position of minimum deviation. Draw a diagram to show this. Label the angle of incidence '*i*' and the angle of emergence 'e'. Write the relationship between them. [3]

(c) The bob of a simple pendulum is imparted a velocity of 5 m s^{-1} when it is at its mean position. To what maximum height will it rise on reaching at its extreme position if 40% of its energy is lost in overcoming the friction of air? ($g = 10$ m s^{-2}) [4]

Question 9

(a) Write three factors on which lateral displacement in a rectangular glass block depends. [3]

(b) A man weighing 480 N carries a load of 120 N up a flight of stairs of 4 m height in 5 seconds. What is his power? How is the power affected, when the time taken by a man to do the same work increases? [3]

(c) A body is moving in a circular path. Answer the following questions related to it. [4]

(i) Name the force which makes the motion in a circular path possible.

(ii) In which direction does the force named in (i) act?

(iii) What is the work done by the above mentioned force? Give reason.

Question 10

(a) A spring is kept compressed by a toy cart of mass 200 g. On releasing the cart, it moves with a speed of 0.2 m s^{-1}. Calculate the potential energy (elastic) of the spring. [3]

(b) A, B and C are three forces each of magnitude 10 N acting in the plane of paper as shown in the diagram. The point 'O' lies in the same plane. Calculate the resultant moment of force about O. [3]