LORETO HOUSE
HALF YEARLY ASSESSMENT (2021-2022)
PHYSICS

CLASS X   **FULL MARKS:30**

ALL QUESTIONS ARE COMPULSORY

Select the correct option for each of the following questions. The intended marks for questions or parts of questions are given in brackets [ ].

1. a) The refractive indices of glass and water with respect to air are 3/2 and 4/3 respectively. The refractive index of glass with respect to water will be   [1]
    i)   8/9
    ii)   9/8
    iii)   7/6
    iv)   None of the above

    b) A radiation P is focused on the bulb of a thermometer. Mercury in the thermometer shows a rapid increase. The radiation P is :   [1]
    i)   visible light
    ii)   ultraviolet radiation
    iii)   infrared radiation
    iv)   X - rays

    c) The size of the image formed by a convex lens of focal length 20 cm of an object 4 cm high placed at a distance of 30 cm from it is :   [1]
    i)   - 6.4 cm
    ii)   8 cm
    iii)   6.4 cm
    iv)   – 8 cm

    d) A total reflecting equilateral prism can be used to deviate a ray of light through
    i)   60°   [1]
    ii)   30°
    iii)   75°
    iv)   90°

    e) From the study of refraction of light through lenses, a student arrived at the following results:
    (A) We may use a convex or a concave lens to form a real image of an object.
    (B) The image formed by a concave lens is always diminished.
    (C) When object is held at a distance = 2f (f = focal length) from the convex lens, then size of image = size of object.
    (D) An image smaller in size than the object cannot be formed using a convex lens.
    Out of the above, the true statement(s) is/are   [2]
    i)   (A) and (C)
    ii)   (B) and (C)
    iii)   (D) only
    iv)   (A) and (D)

f) A triangular glass prism has two triangular faces and three rectangular lateral surfaces. When white light such as sunlight is passed through a glass prism, it splits into its constituent colours. This phenomenon is called dispersion of light. **Answer the following questions based on your understanding of the above paragraph:** [4]

(i) How many refractions does a ray of light undergo, while passing through a prism?
(A)   2
(B)   1
(C)   3
(D)   None of the above

(ii) If A is the angle of prism, 'i' is angle of incidence and 'e' is angle of emergence, then angle of deviation is given by:
(A)   D = i – e + A
(B)   D = - i + e – A
(C)   D = i + e – A
(D)   D = A – i – e

(iii) When a ray of white light passes through a glass prism, it undergoes
(A)   refraction only
(B)   dispersion only
(C)   neither refraction nor dispersion
(D)   both refraction and dispersion

(iv) On passing through a prism, which colour deviates the most?
(A)   Violet
(B)   Yellow
(C)   Red
(D)   Blue

2. a) An essential characteristic of equilibrium is : [1]
   i)   momentum equals to zero
       ii)   acceleration equals to zero
       iii)   kinetic energy equals to zero
       iv)   velocity equals to zero

    b) The SI unit of power is watt. It is expressed in terms of mass, length and time as :
       i) $kg^2 \, m^2 \, s^{-2}$ [1]
       ii) $kg^2 \, m^2 \, s^{-3}$
       iii) $kg^2 \, m \, s^{-2}$
       iv) $kg \, m^2 \, s^{-3}$

    c) A catapult throws a stone of mass 0.1kg with a velocity of 30m/s. If 25% of the potential energy of the elastic band is wasted during transmission, the magnitude of the potential energy will be : [1]
       i)   75 J
       ii)   60 J
       iii)   115 J
       v)   350 J

d)

O   20   50   100
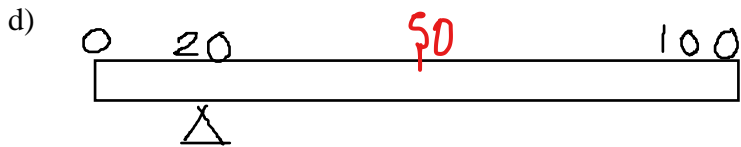
A uniform meter scale is balanced at the 20 cm mark, when a weight of 120 gf is suspended from one end. The weight of the metre scale is: [1]

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       (i)   48 gf
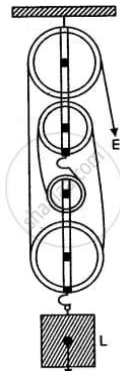   (ii)   50 gf
       (iii)   80 gf
       (iv)   100 gf

$120 \times 50 = 40 \times x$

e) A mechanic can open a nut by applying 120 N force while using a lever of 50 cm length. How long should the handle be, if he wishes to open it by applying a force of only 40 N? [2]

       i)   1 m
       ii)   2 m
       iii)   2.5 m
       iv)   1.5 m

f)

A block and tackle system of pulleys used to lift a load is shown in the above figure. **Answer the following questions based on the diagram.** [4]

   i.   The number of strands of tackle supporting the load are :
  (A) 2
  (B) 2^2
  (C) 2^3
  (D) None of the above

   ii.   When load is pulled up by a distance of 2 m, how far does the effort end move?
  (A) 4 m
  (B) 2 m
  (C) 8 m
  (D) 1 m

$V.R = \dfrac{d_E}{d_L}$ $4 = \dfrac{d_E}{2}$

   iii.   The mechanical advantage of the system is :
  (A) 2
  (B) 4
  (C) 8
  (D) None of the above

   iv.   How much effort is needed to lift a load of 120 N?

(A) 25 N
(B) 30 N
(C) 60 N
(D) 50 N

3. a) Longitudinal waves can travel in   [1]
      i)   solids and liquids
      ii)   liquids only
      iii)   solids, liquids and gases
      iv)   liquids and gases

b) The velocity of sound in air is not affected by change in   [1]
      i)   temperature of air
      ii)   moisture content of air
      iii)   composition of air
      iv)   atmospheric pressure

c) A car blowing its horn at 480 Hz moves towards a high wall at a speed of 20 m/s. If the speed of sound is 340 m/s, the frequency of the reflected sound is   [1]
      i)   480 Hz
      ii)   510 Hz
      iii)   540 Hz
      iv)   570 Hz

d) The centrifugal force is   [1]
   i)   a force of reaction of centripetal force
      ii)   a real force
      iii)   a fictitious force
      iv)   directed towards the centre of circular path

e) An enemy plane is at a distance of 300 km from a radar. Take velocity of radio $= 3 \times 10^8$ m/s. Steps are given to calculate the time for which the radar will be able to detect the plane. Select the correct sequence of steps from the given options :
      i)   300 km / 3×10^8 m/s   [2]
      ii)   300,000 m / 3×10^8 m/s
      iii)   t $= 0.001$ s
      iv)   t $= 1.0 \times 10^{-6}$ s
          (A) i) then iii)
          (B) i) then iv)
          (C) ii) then iii)
          (D) ii) then iv)

f)
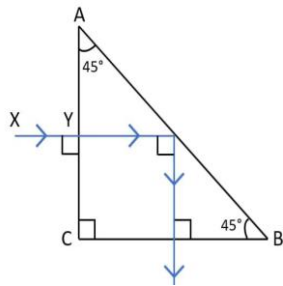
A ray of light XY passes through a right angled prism as shown in the above diagram.
Answer the following questions based on the diagram.   [4]

    i. The angle of incidence at the face AC is
        (A) 90°
        (B) 0°
        (C) 180°
        (D) None of the above

    ii. The angle of incidence at the face AB is
        (A) 90°
        (B) 0°
        (C) 60°
        (D) 45°

    iii. Name the phenomenon which the ray suffers at the face AB :
        (A) Refraction
        (B) Reflection
        (C) Total internal reflection
        (D) None of the above

    iv. Name the instrument where this prism can be used :
        (A) Camera
        (B) Periscope
        (C) Binocular
        (D) None of the above