PRELIMINARY EXAMINATION – DECEMBER '20
SUBJECT: PHYSICS

Class: X
Marks: 80
Time: 2 hrs
Date: 21/12/20

Reading Time: 1:15 p.m. to 1:30 p.m.
Writing Time: 1:30 p.m. to 3:30 p.m.
Uploading Time: 3:30 p.m. to 4:15 p.m.

- *All working and answers to be written in the JNS notebook.*
- *On top of each page write:*
  First Line:
  First and Last Name: _____Class and Division: _____ Roll No.: _____
  Second Line:
  Subject: _____   Date: _____ Page No.: ____
- *On the first page write the Total No. of Pages used:_____*
- *Do not copy the questions.*
- *Take pictures of the written pages using "Scanbot App" or "Adobe Scan App" and save as ".pdf". Upload the .pdf file on Edusprint.*
- *Only when you have completed uploading the document, click the "FINISH" button.*

Answer to this paper must be written on the paper provided separately.
*You will not be allowed to write during the first **15 mins**.*
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 answer.

Attempt all the questions from Section A and four questions from Section B.
The intended marks for questions or parts of questions or parts of questions, are given in brackets [ ]
This paper consists of 6 printed pages.

Section A
Attempt all questions from this section.

Question 1

a) State two factors affecting the turning effect of a force. [2]

b) State the transformation of energy in [2]

(i) A thermocouple

(ii) A dynamo

c) A man raises a box of mass 50 kg to a height of 2 m in 15 seconds, while another man raises the same box to the same height in 20 s. [2]
Compare the work done and the power developed by them.

d) State and define SI unit of power. [2]

e) A pulley system has a velocity ratio of 3 and an efficiency of 75%. [2]

Calculate:

(i) the mechanical advantage of the system

(ii) the effort required to raise a load of 200 N

Question 2

a) What is meant by the statement, 'the critical angle for diamond is 24°'? [2]
Give the relation between critical angle of a material and its refractive index.

b) An electromagnetic radiation has wavelength just above 800 nm. [2]

(i) Name the wave

(ii) State one use of the above wave.

c) A ray is incident normally on an equilateral glass prism. [2]
Critical angle for glass = 42^0.
Copy the diagram and complete the diagram.
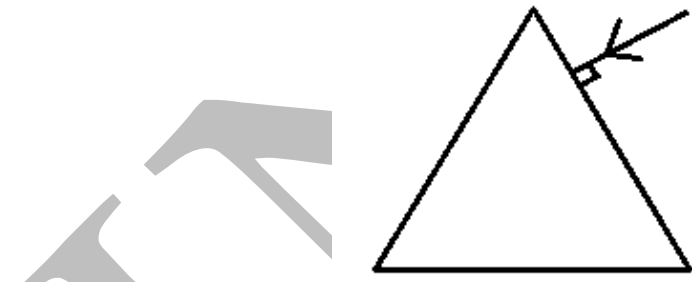
d) An object is placed at a distance of 20 cm in front of a concave lens of focal length [2]
20 cm.
Find:
(i) the position of the image,
(ii) the magnification of the image

e) A monochromatic beam of light undergoes minimum deviation while passing [2]
through an equilateral glass prism.
How does the beam bend within the prism with respect to its base?
What will be the measure of the angle of minimum deviation if the angle of
incidence is 48°?

Question 3

a) The specific heat capacity of water is 4200 $Jkg^{-1}K^{-1}$. [2]
What do you understand by this statement?

b) State two factors which affect the loudness of a sound heard by a listener. [2]

c) What should be the minimum distance between a source of sound of sound and a [2]
reflector in water, so that echo is heard distinctly.
(Speed of sound in water = 1450 ms^{-1})

d) Ice-cream feels colder in the mouth than water at 0°C. Give a reason. [2]

e) Name two sources of background radiations. [2]

Question 4

a) Why is a miniature circuit breaker more convenient than a fuse? [2]

b) State two advantages of connecting appliances in parallel. [2]

c) Water in an electric kettle connected to a 220 V supply took 5 minutes to reach its boiling point. How long will it take if the supply had been of 200 V? [2]

d) An electric heater draws a current of 3.5 A at a p.d. of 250 V. Calculate the power of 4 such heaters. [2]

e) Which radiation produces maximum biological damage? [2]

What happens to the atomic number of an element when the radiation named by you in the earlier question, are emitted?

Section B
### *Attempt any four questions from this section.*

Question 5

a) A glass slab is placed over a page on which the word VIBGYOR is printed with each letter in its corresponding colour.
(i) Will the image of all the letters be in the same place?
(ii) If not, state which letter will be raised to the maximum.
Give a reason for your answer. **[3]**

b) An electric oven is marked 1000 W-200 V. Calculate:
(i) Resistance of its element
(ii) Energy consumed by oven in ½ h in joules
(iii) Time in which it will consume 15 kWh of energy **[3]**

c) A piece of stone tied at the end of a thread is whirled in a horizontal circle with uniform speed by hand.
Answer the following questions:
(i) Is the velocity of the stone uniform or variable?
(ii) What is the direction of acceleration of the stone at any instant?
(iii) What force provides the centripetal force required for circular motion?
(iv) Name the force that acts on the hand and state its direction. **[4]**

Question 6

a) An equal quantity of heat is supplied to two substances A and B.
The substance A shows a greater rise in temperature.
(i) What can you say about the heat capacity of A as compared to that of B?
(ii) What energy change would you expect to take place in the molecules of a substance when it undergoes
    1. A change in its temperature
    2. A change in its state without any change in its temperature **[3]**

b)   A cell of e.m.f. ε and internal resistance r sends current 1.0 A when it is connected   **[3]**
to an external resistance 1.9 Ω. But its sends current 0.5 A when it is connected to
an external resistance of 3.9 Ω. Calculate the values of ε and r.

c)   The figure shows a block and tackle system of pulleys used to lift a load.   **[4]**
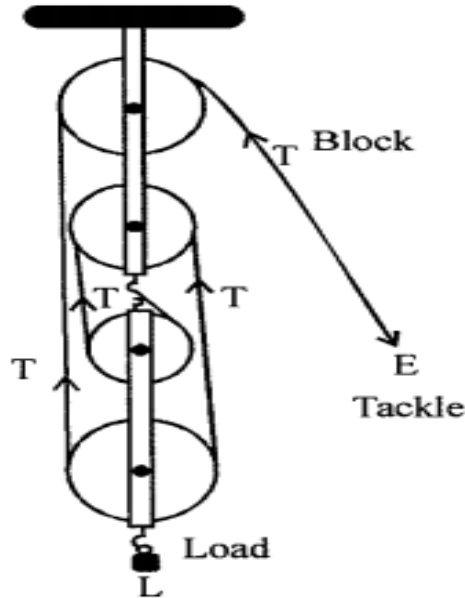
(i) How many strands of tackle are supporting the load?
(ii) What is the mechanical advantage of the system?
(iii) When load is pulled up by a distance 1 m, how far does the effort end move?
(iv) How much effort is needed to lift a load of 100 N?

Question 7

a)   An electrical appliance is rated 1500 W, 250 V. This appliance is connected to 250   **[3]**
V mains.
Calculate :
(i) the current drawn
(ii) the electrical energy consumed in 60 hours
(iii) the cost of electrical energy consumed at the rate of Rs. 3.50 per kWh.

b)   When a tuning fork, struck by a rubber band, is held over a length of air column in a   **[3]**
tube, it produces a loud sound for a fixed length of the air column.
(i) Name the above phenomenon.
(ii) How does the frequency of the loud sound compare with that of the tuning fork?
(iii) State the unit of measuring loudness.

c)   (i) Draw a ray diagram to show the appearance of a stick partially immersed in   **[4]**
water.
(ii) A postage stamp appears raised by 0.8 mm when placed under a thick
rectangular glass block of refractive index 1.5. Find the real thickness of the glass
slab.

Question 8

a) A uniform metre rule of mass 0.06 kg can be balanced at the 70.0 cm mark when a **[3]**
unknown mass is hung from the 94.0 cm mark.
(i) Draw a diagram of the above-mentioned arrangement.
(ii) Find the unknown mass.

b) (i) What material is the calorimeter commonly made of? **[3]**
(ii) Give one reason for using this material.
(iii) How will you reduce loss of heat due to radiation in the calorimeter?

c) An object of mass m is allowed to fall freely from point A which is at a height **[4]**
(x + y) m above the ground while B is y m above the ground, as shown in the
figure.

Calculate the total mechanical energy of the object at
(i) Point A
(ii) Point B
(iii) Point C
(iv) State the law which is verified by your calculations in part (i), (ii) and (iii)

Question 9

a) Draw a diagram to illustrate that a convex lens forms an image of an object equal to **3**
the size of the object.
State two characteristics of the image.

b) (i) Name the colour code of the wire which is connected to the metallic body of an **3**
appliance.
(ii) A power circuit uses a cable having three different wires. Between which two
wires should the heating element of an electric geyser be connected.
(iii) State two characteristics of a fuse wire.

c) A copper calorimeter, weighing 57.5 g, contains 60 g of water at 12°C. **4**
55 g of iron nails at 100°C are dropped into the calorimeter and stirred rapidly.
The final temperature attained by the calorimeter and its contents is 20°C.
Calculate the specific heat capacity of iron.
(Sp. Heat capacity of copper is 0.4 Jg^{-1}°C^{-1})

Question 10

a) (i) Differentiate between any 2 properties of infrared radiations and ultraviolet radiations. **[3]**
radiations.
(ii) What is dispersion of light?

b) (i) A truck weighing 1000 kgf changes its speed from 36 km h^{-1} to 72 km h^{-1} in **[3]**

2 minutes. Calculate:

A) the work done by the engine

B) the power of the engine (g = 10 m s^{-2})
(ii) State the factor affecting centre of gravity.

c) (i) State one safety measure to be considered while establishing a nuclear power **[4]**
plant.
(ii) Radioactivity is a nuclear phenomenon. Why?
(iii) State one use of alpha radiations and beta radiations.

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