K.E.CARMEL SCHOOL, SARISHA

1st Term Examination 2021-22

Class: X **Subject: Physics** **Full Marks: 100** **Time: 2 hrs**

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

This time is to be spent in reading the question paper.

Time given at the head of this papers the time allotted for writing the answers.

Attempt **all** the questions from **Section A** and **any four** questions from **Section B**

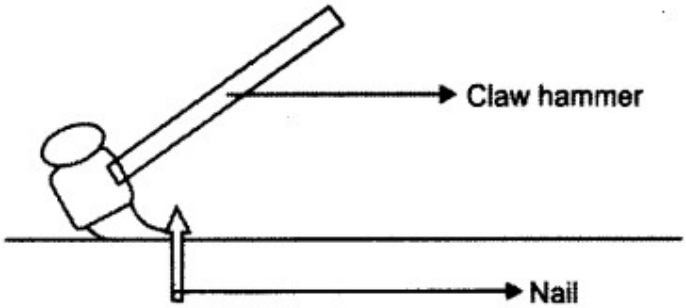
The indented marks for questions or parts of questions are given in brackets []

Section A [40 Marks]

Attempt all the questions from this section.

Question 1.

(a) The diagram below shows a claw hammer used to remove a nail:



i) To which class of lever does it belong ?

(ii) Give one more example of the same class of lever mentioned by you in (i) for which the mechanical advantage is greater than one. **[2]**

(b) Two bodies A and B have masses in the ratio 5:1 and their kinetic energies are in the ratio 125:9. Find the ratio of their velocities. **[2]**

(c) (i) Name the physical quantity which is measured in calories

(ii) How is calorie related to the SI unit of that quantity? **[2]**

(d) (i) Define couple.

(ii) State the SI unit of moment of couple. **[2]**

(e) (i) Define critical angle.

(ii) State one important factor which affects the critical angle of a given medium. **[2]**

Question 2.

a) A body of mass 500g is moving with a speed 10m/s. A force on it which makes it to move with a speed 20 m/s. Find i) change in K.E of the body and ii) the work done by the force on the body. [3]

b) A pulley has a V.R 2 and M.A 1.6. Name the pulley and state factors which make the M.A less than the V.R. [3]

c) A convex lens of focal length 20 cm forms a virtual image of size twice the size of the object [4]

i) how is the distance of image v related to the distance of object u?

ii) what is the power of lens?

Question 3.

a) A crane **A** lifts a heavy load in 5 sec, whereas another crane **B** does the same work in 2 sec. Compare the power of the crane **A** to that of crane **B**. [3]

b) The wave lengths for the light of red and blue colours are nearly 7.8 $X10^{-7}$ m and 4.8 $X\ 10^{-7}$ m respectively [2]

i) which colour has the greater speed in the vacuum ?

ii) which colour has the greater speed in the glass ?

c) Derive the relationship between *joule and erg*. [3]

d) When a ball thrown vertically upwards negative work is done. Explain. [2]

Question 4.

a) How would you erect an inverted image without deviation? Draw a ray diagram for your answer. [2]

b) Draw a ray diagram to show the formation of an image in a concave lens for an object at infinity. [2]

c) What do you understand by clockwise and anti-clockwise moment? When it is taken positive? [3]

d) Is centrifugal force a real one? Explain. [3]

SECTION- B[40 MARKS]

Answer any four(4)questions

Question: 5

a) A water pump rises 50 litres of water through a height of 25m in 5s. Calculate the power of the pump required. **[2]**

b) **A** boy of mass 40 kg climbs up the stairs and reaches the roof at a height of 8m in 5s. Calculate **[2 X 4=8]**

i) the force of gravity acting on the boy

ii) the work done by him against the force of gravity

iii) The power spent by the boy.

iv) define 1 erg of work

Question: 6 **[2 X 5=10]**

A uniform metre rule of mass 100 g is balanced on a fulcrum at mark 40cm by suspending an unknown mass of *m* at the mark 20m.

i) find the value of *m*

ii) to which side the rule will tilt if the mass *m* is moved to the mark 10cm?

iii) What is the resultant moment now?

iv) How can it be balanced by another mass of 50g?

v) Write the conditions required for a body to be in equilibrium.

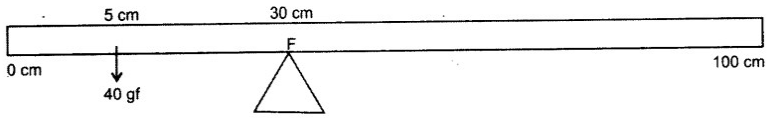
Question 7.

(a) A body of mass 10 kg is kept at a height of 5 m. It is allowed to fall and reach the ground. **[3]**

(i) What is the total mechanical energy possessed by the body at the height of 2 m assuming it is a frictionless medium?

(ii) What is the kinetic energy possessed by the body just before hitting the ground? Take g= 10 m s^{-2}.

(b) A uniform metre scale is in equilibrium as shown in the diagram : **[3]**



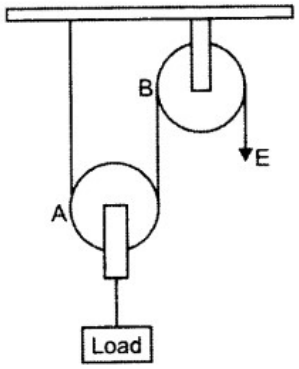
i) Calculate the weight of the metre scale.

(ii) Which of the following options is correct to keep the ruler in equilibrium when 40 gf wt is shifted to 0 cm mark?

F is shifted towards 0 cm **OR**

F is shifted towards 100 cm.

(c) The diagram below shows a pulley arrangement: **[4]**



(i) Copy the diagram and mark the direction of tension on each strand of the string.

(ii) What is the velocity ratio of the arrangement?

iii) If the tension acting on the string is T, then what is the relationship between T and effort E?

(iv) If the free end of the string moves through a distance x, find the distance by which the load is raised.

Question 8. **[2 X5=10]**

A point source of light O of a single colour is seen through a rectangular glass slab PQRS. The path of the two rays in and outside the slab are shown

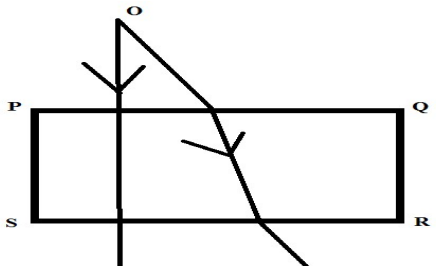
i) in the diagram label the position I of the source O where it will appear when seen through the surface RS.

ii) does the source O appear to be nearer or farther with respect to the source PQ?

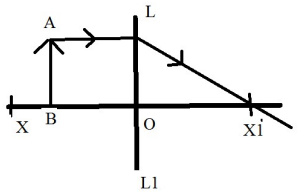
iii) How does the shift depend on the thickness of the slab?

iv) justify your answer in (ii) with the help of appropriate ray diagram.

v) for the same rectangular glass slab which colour from the visible spectra (violet to red) will produce the maximum shift?



Question 9. **[2 X5=10]**



Study the diagram given

a) Name the lens L L1

b) What are the points X X1 called ?

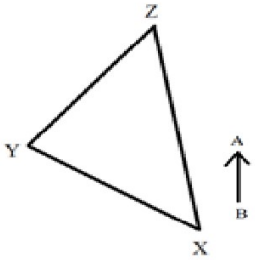
c) Complete the diagram to form the image of the object AB.

d) State three characteristics of the image

e) Name a device in which this action of lens is used

Question 10.

a) *A right angled prism is placed before an object. Trace the path of two rays from A and B normal to the hypotenuse* [3]



b) What are ultra violet radiations? How are they detected? State one use of this radiation. [3]

c) What should be the angle between the force and the displacement in order to get **i)** *the minimum work* **ii)** *the maximum work.* Show your working. [4]

[Internal- 20Marks]