Ram Mohan Mission High School

SELECTION I EXAMINATIONS 2021-2022

Subject : Physics

Time : 1 Hr. Class – X F.M. : 40

Question 1

a. For a given machine of a particular shape which of the following factors remain constant?[1]
   1. Mechanical advantage
   2. Velocity ratio
   3. Efficiency
   4. Work output

b. Work done by a force on a body is negative when [1]
   1. Displacement of the body is perpendicular to the direction of the force applied.
   2. Displacement is directed along the direction of the applied force
   3. Displacement of the force is in the direction opposite to the applied force
   4. Displacement of the body is zero.

c. Speed of sound in water is 1400 m/s. What is the minimum distance between the source of sound and the reflecting surface such that a clear echo can be heard? [1]
   1. 17 m
   2. 70 m
   3. 140 m
   4. 14 m

d. To open a nut a plumber uses a spanner of length 25 cm while applying a force of 10 N. If he has to use a spanner of length 20 cm what force must he apply to open the same nut? [1]
   1. 10 N
   2. 12 N
   3. 12.5 N
   4. 20 N

e. A uniform metre rule of mass 200 g is placed on a knife edge at 40 cm mark. [2]

   (i) Find the moment of force developed about the knife edge.

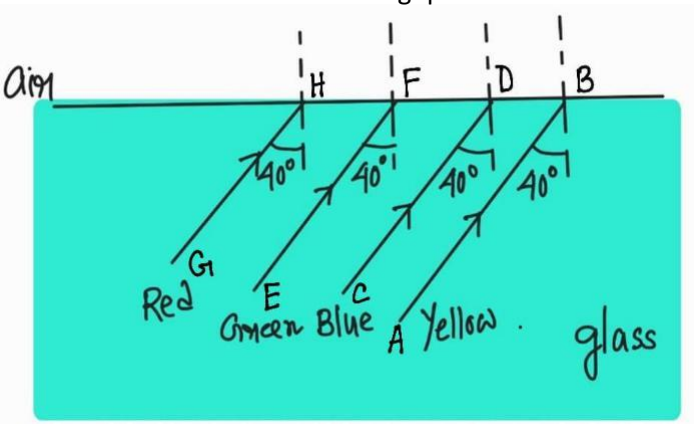
   1. 2 kgf m 2. 2000 kgf m 3. 2 kgf cm 4. 2 gf cm

   (ii) What is the weight of the body that should be hung from 20 cm mark to balance the scale?

   1. 100g 2. 100 gf 3. 200 g 4. 200 gf

f. Consider the following ray diagram. Consider the value of critical angle for yellow light to be 40^0 for air -glass combination. Answer the following questions. [4]

VIBGYOR



(i). What will happen to the yellow light ray AB?

1. It will suffer refraction at an angle of refraction greater than 40^0 .
2. It will suffer refraction at an angle less than 40^0 .
3. It will suffer total internal reflection.
4. It will graze along the surface of separation of glass and air.

(ii). What will happen to the blue light ray CD?

1. It will suffer refraction at an angle of refraction greater than 40^0 .
2. It will suffer refraction at an angle less than 40^0 .
3. It will suffer total internal reflection.
4. It will graze along the surface of separation of glass and air.

(iii). What will happen to the green light ray EF?

1. It will suffer refraction at an angle of refraction greater than 40^0 .
2. It will suffer refraction at an angle less than 40^0 .
3. It will suffer total internal reflection.
4. It will graze along the surface of separation of glass and air.

(iv). What will happen to the red light ray GH?

1. It will suffer refraction at an angle of refraction greater than 40^0 .
2. It will suffer refraction at an angle less than 40^0 .
3. It will suffer total internal reflection.
4. It will graze along the surface of separation of glass and air.

Question 2

a. What energy does a compressed spring of a watch contain? [1]

1. Elastic potential energy.
2. Kinetic energy.
3. Gravitational potential energy.
4. Chemical energy.

b. A given electromagnetic wave has a wavelength of 300 nm. Identify the wave. [1]

1. Visible light 2. Ultraviolet wave. 3. Microwaves 4. X-Ray

c. A boy of mass 60 kg and a girl of mass 50 kg goes to the top of a building taking the same time. What is the ratio of the amount of power developed by the boy to the power developed by the girl? [1]

1. 6:5 2. 5:6 3. 1:2 4. 2:1

d. An object of height 3 cm is placed in front of a convex lens of focal length 12 cm at a distance of 24 cm from the lens. Find the height of the image formed. [1]

1. 0.3 cm 2. 3 cm 3. 6 cm 4. 1.2 cm

e. What will happen to the kinetic energy of a body if…… [2]

(i) velocity of the body is doubled keeping its mass constant?

1. Kinetic energy becomes double the initial kinetic energy.

2. Kinetic energy becomes half the initial kinetic energy.

3. Kinetic energy becomes four times the initial kinetic energy.

4. Kinetic energy does not change.

(ii) momentum of the body is doubled keeping its mass constant? 1.

Kinetic energy becomes double the initial kinetic energy.

2. Kinetic energy becomes half the initial kinetic energy.

3. Kinetic energy becomes four times the initial kinetic energy.

4. Kinetic energy does not change.

f. A stone of mass 5 kg is dropped from the top of a tower of height 180 m. The velocity of the stone just before hitting the ground is 50 ms^{-1}.Take g=10ms^{-2}. [4]

(i) What is the gravitational potential energy of the stone at the top of the tower?

1. 900J 2.90 J 3.9000 J 4. 10000J

(ii) What is the kinetic energy of the stone just before touching the ground?

1. 6500 J 2. 6250 J 3. 5500 J 4.5350 J

(iii) What is the amount of energy lost due to friction of air?

1. 3500 J 2. 5600 J 3. 2750 J 4. 4650 J

(iv) What is the force of friction developed by air on the stone?

1. 13.3 N 2. 14.3 N 3.15.3 N 4.16.3

Question 3.

a. A block and tackle system with effort being applied in a convenient direction has four fixed pulleys. Which of the following is a probable velocity ratio of the block and tackle system? [1]

1. 4 2. 8 3. 2 4. None of these

b. Which of the following statements is true? [1]

1. To hear echo distinctly the minimum distance between the source of sound and the reflecting surface must be always equal to 17 m.
2. To hear echo distinctly the reflected sound must reach our ear within 0.1 s of the original sound.
3. To hear echo distinctly the size of the reflector must be smaller than the wavelength of sound
4. None of the statements are correct.

c. A given electromagnetic wave can pass through a quartz prism but is absorbed by glass prism.

Identify the wave. [1]

1. Gamma ray 2.Ultraviolet waves 3.Infrared waves. 4.Microwaves

d. Refractive index of glass is 1.8 and that of water is 1.2. Find the refractive index of glass with respect to water. [1]

1. 1.5 2. 0.5 3. 0.67 4. 1.0

e. A man standing in front of a cliff fires a gun and hears the echo after 4s. The man then moves away from the cliff by 320 m and fires the gun again. This time he hears the echo after 6 s. [2]

(i) Find the initial distance between the man and the cliff.

1. 340 m 2.640 m 3.880 m 4. 680 m

(ii) Find the speed of sound in air.

1. 300 ms^{-1} .
2. 320 ms^{-1} .
3. 340 ms^{-1} .
4. 360 ms^{-1} .

f. An object of height 3 cm in placed at a distance of 10 cm form a concave lens of focal length 30 cm. Answer the following questions. [4]

(i) What is the distance of the image from the lens?

1. 7.5 cm 2. 75 cm 3. 6.5 cm 4. 8.0 cm

(ii) What is the nature of the image formed?

1. Real and inverted
2. Real and erect
3. Virtual and erect
4. Virtual and inverted

(iii) What is the magnification produced?

1. + 0.25 2. – 0.25 3. + 0.75 4. – 0.75

(iv) What is the size of the image formed?

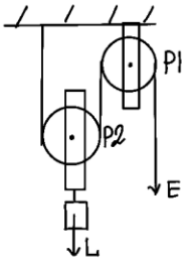
1. 0.75 cm 2. 2.25 cm 3. 12 cm 4. 1.5 cm

Question 4.

a. Name the energy change that takes place while charging a secondary cell [1]

1. Chemical energy to mechanical energy'
2. Chemical energy to electrical energy
3. Electrical energy to mechanical energy
4. Electrical energy to chemical energy

b. For the given pulley system what is the purpose of the pulley P2? [1]



1. It acts as a force multiplier.
2. It acts as a speed multiplier.
3. It acts both as a force and speed multiplier.
4. It allows us to apply force in a convenient direction.

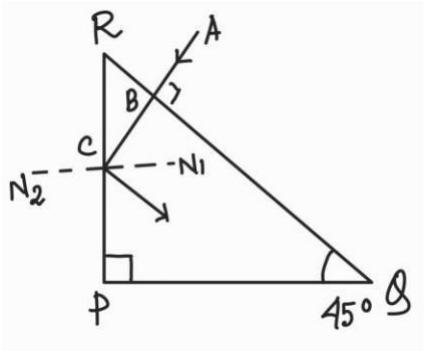
c. For a geometrically symmetric body which of the following statements is true? [1]

1. The centre of gravity always lies outside the body.
2. The centre of gravity always lies inside the body.
3. The centre of gravity may or may not coincide with the geometric centre of the body.
4. The centre of gravity always lies at the geometric centre of the body.

d. For a body revolving in a circular path the work done by the centripetal force on the body at any instant is zero because [1]

1. Centripetal force is balanced by centrifugal force at every instant
2. Centripetal force is a pseudo force
3. Centripetal force is perpendicular to the instantaneous displacement of the body
4. Effective displacement of the body is zero.

e. Consider the following diagram. The ray AB falls normally on the surface RQ of the glass prism PQR. [2]



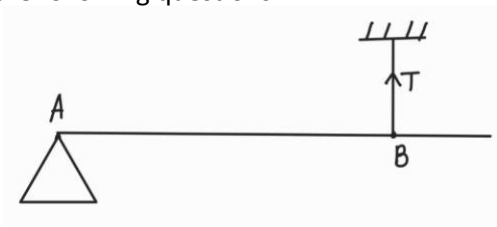
(i) Find the value of the angle BCN_1

1. 30^0. 2.60^0. 3.45^0. 4.0^0.

(ii) Find the Angle of incidence inside glass at the surface PQ

1. 30^0. 2.60^0. 3.45^0. 4.0^0.

f. A uniform metal rod of mass 4 kg and length 2m is placed on a support at the point A as shown in the diagram below. The rod is kept horizontal by attaching a string at the point B and hanging it tightly and vertically from a rigid support as shown. Given AB=1.5 m. Take g=10 ms^{-2}. Answer the following questions. [4]



(i) Find the clockwise moment about A.

1. 4 Nm 2. 40 Nm 3. 0.4 Nm 4. 0.4 kgf m

(ii) Find the anti-clockwise moment about A.

1. 4 Nm 2. 40 Nm 3. 0.4 Nm 4. 0.4 kgf m

(iii) What is the total moment of force about A?

(iv) What is the tension in the string?

1. 16.7 N 2. 26.7 N 3. 36.7 N 4. 46.7 N