

Answer to this paper must be written on the paper 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.

Section A is compulsory. Attempt any four questions from Section B

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

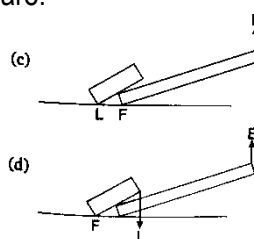
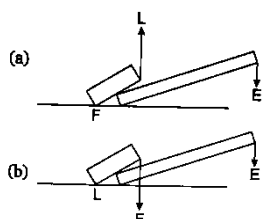
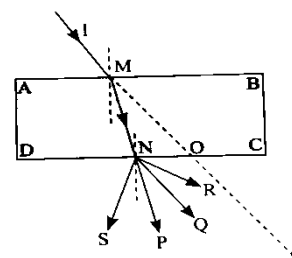
“Section –A” (40 Marks)

Question -1

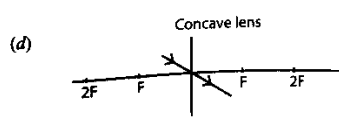
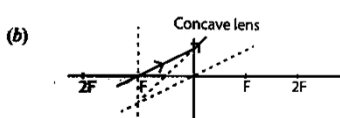
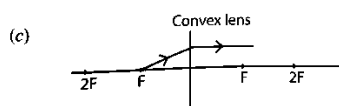
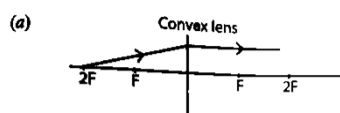
[1X15]

Choose the correct answers to the question from the given option.

- (i) In a second order lever, if the length of the load arm is 5 cm, the length of the effort arm cannot be
 (a) 4 cm (b) 6 cm (c) 10 cm (d) 20 cm
- (ii) Which of the following values can represent the magnification of a simple microscope
 (a) +1 (b) -1 (c) +2 (d) -2
- (iii) Which of the following is the correct mathematical relation?
 (a) Power= force/velocity (b) power= force x acceleration
 (c) power= force /acceleration (d) power= force x velocity
- (iv) The focal length of the glasses of a shortsighted person is 40 cm. What is the nature of the lens and its power
 (a) convex, 2.5 D (b) concave, -2.5 D
 (c) convex, 2.0 D (d) concave, -2.0 D
- (v) During power production in a coal based electric power plant, the correct sequence of energy conversions taking place is
 (a) heat → mechanical → chemical (b) heat → mechanical → electrical
 (c) chemical → heat → light (d) heat → chemical → electrical
- (vi) A ray of light IM is incident on a glass slab ABCD as shown in the figure alongside. The emergent ray for this incident ray is
 (a) NQ (b) NR
 (c) NP (d) NS

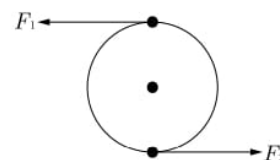


- (viii) Select the true statement for dispersion of white light by a prism placed in air
- On both the surfaces of the prism only deviation takes place
 - On both the surfaces of the prism, only dispersion takes place
 - on both the surfaces of the prism, reflection takes place
 - On the first surface of the prism, dispersion and deviation takes place, and on the second surface only deviation takes place.
- (ix) **Assertion (A):** When the coolie walks on the horizontal ground, while carrying a load on his head, no work is done against the force of gravity.
Reason (R): The coolie does work against the force of friction when he moves with the load.
- Both A and R are true.
 - Both A and R are false.
 - A is true but R is false.
 - A is false but R is true.
- (x) In which of the following diagrams is the refraction not correct



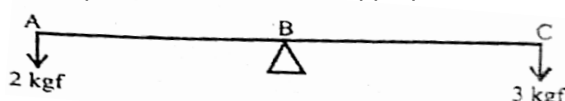
- (xi) In the diagram alongside, $F_1 = F_2$ acting on a wheel of radius 2.5 m produce a moment of couple of 100 Nm. The magnitude of each force acting on the wheel is

- 4.0 N
- 40.0 N
- 20.0 N
- 2.0 N



- (xii) In the diagram given below, the rod AC pivoted at B is in equilibrium. Choose the appropriate relation

- $AB = 2/3 BC$
- $AB = 3/2 BC$
- $AB = 3/5 BC$
- $AB = 2/5 BC$



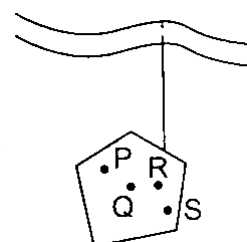
- (xiii) When a force is applied at different angles to the displacement, in which case is the work done maximum?
- force at 45° to the displacement
 - force at 0° to the displacement
 - force at 90° to the displacement
 - force at 180° to the displacement

- (xiv) Why is the MA of a single movable pulley always 2 in ideal conditions

- because the load is distributed between two strings
- because the effort moves twice the distance that the load moves
- because the pulley has a radius ratio of 2:1
- because the pulley doubles the applied force.

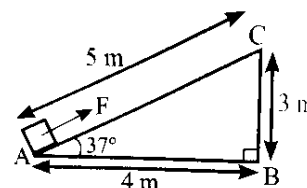
- (xv) A non-uniform kite is hanging freely from a branch of a tree as shown in the figure. Which is the most probable position of the centre of gravity

- P
- Q
- R
- S

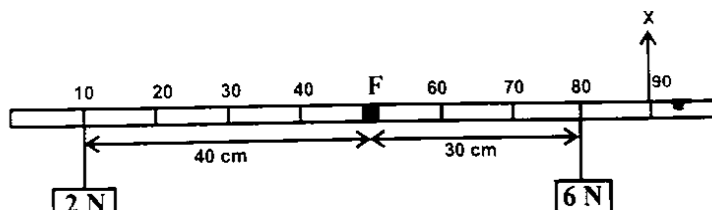


Question -2

- (i) Complete the following by choosing the correct answers from the brackets. [6]
- If different colours of light strike a rectangular glass block at same angle of incidence, then maximum lateral displacement will be shown by _____. (red/green/blue)
 - In a block and tackle system, increase in the weight of the movable block _____ [decreases, does not affect, increase the efficiency of pulley system].
 - When a stone tied to a string is rotated in a horizontal plane, the tension in the string provides the _____ force necessary for circular motion, (centripetal, frictional, centrifugal)
 - The magnification of an image in a lens is -2 . The image is _____ (diminished, magnified, same size)
 - A coconut tree appears to be _____ when viewed by a sea diver from below the water surface. (shorter/ taller/of same size)
 - A force F moves a load from A to C as shown in the figure alongside. For the calculation of work done which of these lengths would you use as displacement? _____ (3m/ 4m /5m)



- (ii) A metre rule is pivoted at its midpoint vertically. Downward forces of 2N and 6N are applied at the 10cm and 80 cm marks respectively. What vertical upward force must be applied at the 90 cm mark if the rule is to balance horizontally? [2]



- (iii) Name the physical quantity that: [2]
- remains constant during circular motion
 - changes continuously during circular motion.

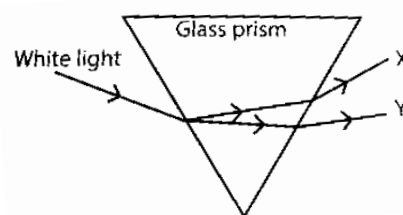
Question -3

- (i) Name the radiations. [3]
- that is known for its effect on silver chloride solution.
 - obtained by using a rock salt prism
 - whose wavelength is between 100 nm to 400 nm.
- (ii) A lens has focal length 20 cm and forms an inverted image at a distance of 60 cm from the lens. Identify the lens and calculate its magnification [2]
- (iii) A hollow ice cream cone has height 6 cm. [2]
- Where is the position of its centre of gravity from its broad base?
 - Besides the shape which other factor determines the c.g of bodies ?
- (iv) Vijay and Binay are in the weightlifting room. Vijay lifts 20 kg barbell over his head 10 times in one minute. Binay lifts the 20 kg barbell over his head 10 times in 10 seconds. [2]
- Who does more work?
 - Who delivers more power? Explain your answers.

- (v) The diagram below shows the extreme colours of a visible spectrum. (X and Y).

(a) Identify the colours X and Y.

(b) Which colour has a greater speed in vacuum?



[2]

- (vi) State the two conditions necessary for total internal reflection.

[2]

- (vii) (a) Define scattering.

(b) The smoke from a fire looks white. Which of the following statements is true?

(i) Molecules of the smoke are bigger than the wavelength of light.

(ii) Molecules of the smoke are smaller than the wavelength of light.

[2]

“Section –B”(40 Marks)
(Answer ANY FOUR)

Question - 4

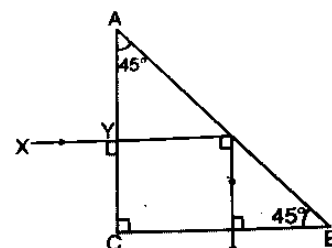
[3+3+4]

- (i) A ray of light XY passes through a right angled isosceles prism as shown in the figure.

(a) What is the angle through which the incident ray deviates and emerges out of the prism?

(b) Name the instrument where this action of prism is put into use.

(c) Which prism surface will behave like a mirror?

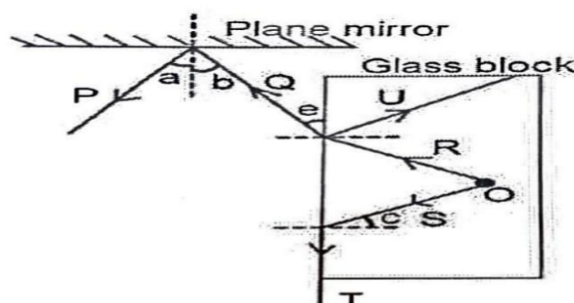


- (ii) (a) How does the angle of deviation depend on angle of the prism?

(b) Draw a graph showing the change in angle of deviation with angle of incidence.

- (iii) O is a luminescent particle trapped inside a glass block. A student traces the path of rays coming out of it and reflecting over a plane mirror as shown in the diagram below.

Complete the table using the labels from the figure. The first one is done for you.

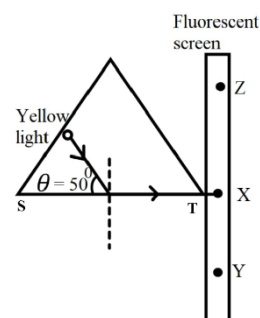


Complete the table, using the labels from the figure. The first one is done for you.

Sl. No	Description	Label
a.	An angle of reflection on the mirror	a
b.	A partially reflected ray in the glass slab	
c.	A critical angle	
d.	A refracted ray	
e.	An angle of refraction of the ray R	

Question-5**[3+3+4]**

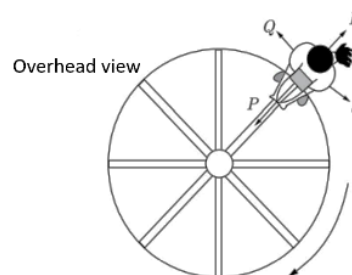
- (i) The diagram given below shows a triangular prism of a certain material with a fluorescent screen placed adjacent to it. The yellow light ray striking the surface ST of the prism shows a fluorescent spot at the point X.
- (a) Calculate the critical angle of the material of the prism for yellow colour.
- (b) To move the fluorescent spot towards Y, the value of θ should be _____ (>50 , <50 , or $=50$)
- (c) Which direction will the fluorescent spot move if the yellow light is replaced with indigo light? (towards Y or towards Z)
- (ii) Draw a neat ray diagram to show the image formed by a magnifying glass.
- (iii) a) In a multiple reflection in the thick plane mirror, which image is the brightest one? Give reason.
- b) In an equilateral prism, the angle of minimum deviation is 40° . At what angle of incidence does the ray fall on the prism?

**Question-6****[3+3+4]**

- (i)
- a) Define the phenomenon which causes the sky to appear blue and explain it.
- b) Name the phenomenon on which optical fibres work.
- b)
- (a) Derive a relationship between mechanical advantage, velocity ratio and efficiency of a machine.
- (b) Explain why a pair of cloth cutting scissors have their blades longer than their handles
- c)
- (a) Draw a neat diagram of block and tackle system of pulleys with velocity ratio 3. In the diagram indicate clearly the points of application and the direction of load L and effort E. Also mark the tension T in each strand.
- (c) A man raises a load of 300 kgf using a block and tackle system of 3 pulleys. If the efficiency of the pulley system is 60%, what effort is applied by the man?

Question – 7**[3+3+4]**

- (i) A girl and her father visit a children's playground. The diagram shows the girl holding on to a round wheel. A centripetal must act because the girl moves in a circular path.
- (a) In which direction PQRS does the centripetal force act?
- (b) What provides this centripetal force in the above case?
- (c) Give one difference between centripetal and centrifugal force.
- (ii) A catapult throws a stone of mass 0.10 kg with a velocity of 30 m/s. If 25% of the potential energy of the elastic band is wasted during transmission, find the magnitude of the potential energy.

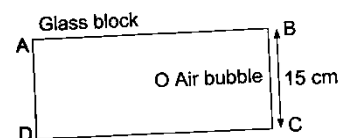


- (iii) A machine has a velocity ratio of 5. It is used to raise a load of 500 N by 3 m using an effort of 20 kgf. Find
- the work obtained from the machine
 - The MA
 - efficiency of the machine
 - work done on the machine. (take $g = 10 \text{ m/s}^2$)

Question - 8

[3+3+4]

- State and define the SI unit of power.
 - Give one example of chemical energy changing to electrical energy.
- A rectangular glass block of refractive index 1.5 has an air bubble trapped inside it as shown in the diagram. When seen from the surface AB, it appears to be 4 cm deep. Calculate the actual depth of the air bubble from the surface AB
 - For which colour of light, blue or yellow, the apparent depth will be greater?
- State Snell's laws of refraction
 - Explain why a swimming pool appears shallower than it really is.



Question - 9

[3+3+4]

- List two differences between an ideal and an actual machine.
 - Why can't a machine be 100 % efficient?
- An oscillating simple pendulum rises to a maximum vertical height of 6 cm at its extreme positions. If the mass of the bob is 300g, find
 - the velocity of the bob at its mean position
 - The total energy of the pendulum while oscillating. Neglect the friction due to air. (take $g = 10 \text{ m/s}^2$)
 - State the principle on which the above case works.
- A concave lens has radius of curvature 40 cm. At what distance from the lens, a 5 cm tall object be placed so that it forms the image at 15 cm from the lens? Also calculate the size of the image formed.

***** ALL THE BEST *****