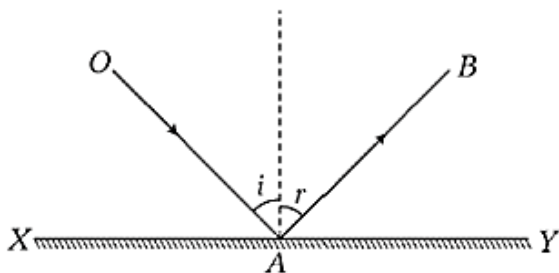


**SECTION – 1 (PHYSICS)**

- Balanced forces means net force = 0  
Which implies acceleration = 0
- Given,  $F = 72 \text{ dyne} \Rightarrow F = 72 \times 10^{-5} \text{ N}$ ,  
 $\theta = 60^\circ$ ,  $m = 9\text{g} = 9 \times 10^{-3} \text{ kg}$   
 $F' = ma$   
In this case,  $F' = F \cos 60^\circ$   
 $\Rightarrow a = \frac{F'}{m} = \frac{F \cos 60^\circ}{9 \times 10^{-3}}$   
 $= \frac{72 \times 10^{-5} \times \cos 60^\circ}{9 \times 10^{-3}} = 8 \times 10^{-2} \times \frac{1}{2}$   
 $= 4 \times 10^{-2} \text{ ms}^{-1} = 4 \text{ ms}^{-1}$
- Given,  $m = 60\text{kg}$  and  $a = 1 \text{ ms}^{-2}$   
 $\therefore$  Net force,  $F_{\text{net}} = \text{Mass} \times \text{Acceleration} = 60 \times 1 = 60 \text{ N}$

4.



Here, XY is a plane reflecting surface,  
OA and AB are the incident and reflected rays, respectively  
 $i$  = angle of incidence  
 $r$  = angle of reflection

As,  $AB \perp OA$ ,

$$\therefore i + r = 90^\circ$$

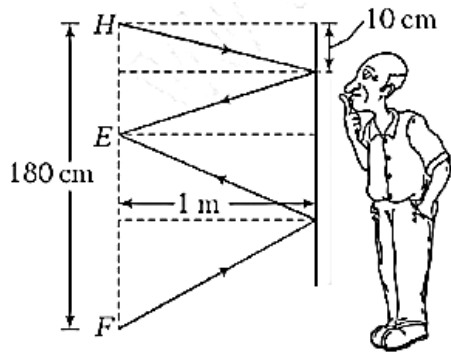
Also, according to laws of reflection,

$$r = i = 90^\circ$$

$$\therefore i + i = 90^\circ \Rightarrow 2i = 90^\circ$$

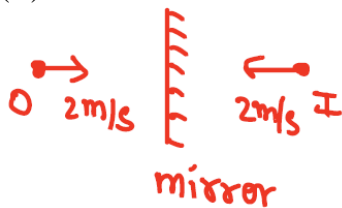
$$i = \frac{90^\circ}{2} = 45^\circ$$

- According to ray diagram shown in figure



Length of mirror =  $\frac{1}{2}(10 + 170) = 90 \text{ cm}$

6. (B)



$|\vec{v}_{OI}| = 2 - (-2) = 4 \text{ m/s}$

7. Given,  $u = -30 \text{ cm}$   
 $v = -30 \text{ cm}$

Using relation,  $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$\frac{1}{-30} + \frac{1}{-30} = \frac{1}{f}$

$\therefore$  Focal length of the mirror  $f = -15 \text{ cm}$

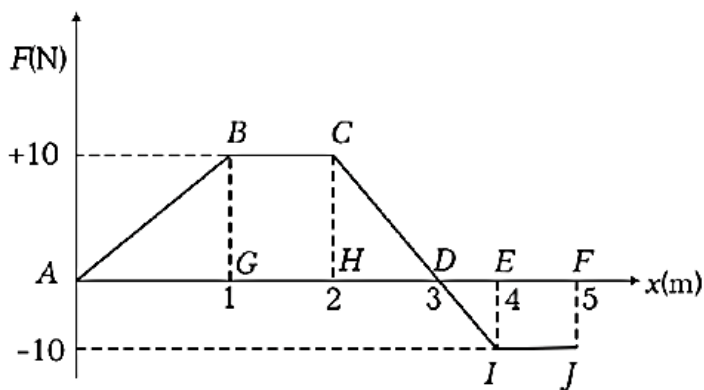
8. Magnification,  $m = \frac{f}{f - u}$

$\Rightarrow \left(+\frac{1}{4}\right) = \frac{+30}{+30 - u}$

$\Rightarrow$  The distance of the object from the mirror,  $u = -90 \text{ cm}$

9. Given,  $F = 20 \text{ kg-wt} = 20 \times 9.8 \text{ N}$ ,  $s = 20 \text{ m}$  and  $\theta = 60^\circ$   
 $\therefore$  Work done =  $Fs \cos \theta = 20 \times 9.8 \times 20 \times \cos 60^\circ = 1960 \text{ J}$

10. Work done = Area under F-x graph  
 = Area of  $\Delta ABG$  + Area of rectangle of BGHC +  
 Area of  $\Delta CDH$  + Area of  $\Delta DEI$  + Area of rectangle EFJI



$$= \left(\frac{1}{2} \times 10 \times 1\right) + (10 \times 1) + \left(\frac{1}{2} \times 10 \times 1\right) + \left(\frac{1}{2}(-10) \times 1\right) + (-10 \times 1)$$

$$\Rightarrow W = 5 \text{ J}$$

### SECTION – 2 (CHEMISTRY)

No Solutions

### SECTION – 3 (BIOLOGY)

21. Guard cells help in transpiration (a process in which water losses from a plant in the form of water vapour). These cells are paired epidermal cells that control the opening and closing of stomata with the changes in the turgidity of the cell.
22. Translocation of food in the flowering plants occurs in the form of sucrose. It is transported by the vascular tissue phloem from a source (regions of excess carbohydrates, primarily mature leaves) to sinks (regions where the carbohydrate is needed).
23. Photosynthesis is the most important anabolic process on earth. It is defined as the transformation of photonic energy (i.e. light or radiant energy) into chemical energy by the given parts of the plants. In the process of photosynthesis, light energy drives the synthesis of carbohydrates from carbon dioxide and water with the generation of oxygen.
24. Photosynthesis is the process by which plants use the energy from sunlight to produce sugar (fuel) used by all living things. The photosynthesis equation is a chemical representation of the process of photosynthesis which takes place in the chloroplasts. Plants take in carbon dioxide and water to produce glucose (carbohydrate) and oxygen. The following is the chemical equation, which explains this process:
 
$$6\text{CO}_2 + 12\text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$$
25. ATP is a nucleotide found in the mitochondria of all plant and animal cells. It is the major source of energy for cellular reactions and is commonly known as the energy currency of the cell. This energy is released during its conversion to ADP.
26. (1)
27. Respiration is a metabolic process in which energy is produced with the intake of oxygen and the release of carbon dioxide from the oxidation of complex organic substances along with water.

28. Glycolysis occurs in the cytoplasm and does not use oxygen. Thus, it is an anaerobic pathway. In this process, glucose is partially oxidized/converted into two molecules of pyruvate/pyruvic acid. In aerobic respiration pyruvate enters mitochondrion through a specific transport protein. It undergoes oxidation decarboxylation and dehydrogenation of produce  $\text{CO}_2$  and NADH.
29. Yeast cell perform alcoholic fermentation under anaerobic condition where incomplete oxidation of glucose is achieved by sets of reaction in which pyruvic acid is converted to  $\text{CO}_2$  and ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ). The enzymes, pyruvic acid decarboxylase and alcohol dehydrogenase catalyse these reactions.
30. In yeast, cell division results in a small cell called bud. Bud is a small rounded outgrowth on an asexually reproducing organism, such as a yeast or Hydra, which is capable of developing into a new individual.
31. When both the essential whorls are present in the same flower, it is described as bisexual, e.g., cruciferae, malvaceae etc.
32. Pollen grains are produced within the anther of stamen. Anther is the pollen-bearing part at the upper end of the stamen of a flower. Most anthers occur at the tip of a slender, stem-like filament and have two lobes. Each lobe contains two pollen sacs. When pollen matures in the pollen sacs, the lobes of the anthers burst open in the process known as dehiscence to release the pollen.
33. Gynoecium or pistil is the female whorl that is differentiated into the overt, style and stigma. Androecium is the male reproductive organ consisting of stamen. Each stamen is distinguishable into anther and filament joined by a connective.
34. Allele or allelomorph is a pair of contrasting characters in Mendelian crosses. Alleles are slightly difference forms of the same gene.
35. Monohybrid cross is the ratio which is obtained in  $F_2$  generation when monohybrid cross is made & the offsprings of  $F_1$  generation are self bred.  
Mendel crosses pure tall and dwarf plants. The plants belonged to  $F_1$  generation, all tall hybrid, were self-pollinated. The plants of  $F_2$  generation were both tall and dwarf, in approximate 3:1 ratio phenotypically and 1:2:1 genotypically.
36. Mendel selected Garden pea as material for his hybridization experiments because of the following reasons:  
(i) Hybridization or crossing in pea is easy.  
(ii) It has bisexual flowers.  
(iii) It has number of well defined contrasting characters.  
(iv) It shows predominantly self-fertilization.  
(v) It has a short life span.
37. (2)
38. (1)
39. (4)

40. (2)  
Bees are important to agriculture as they perform pollination. Bees are responsible for over 80% of all pollination done by insects. Plants pollinated by insects are colorful with fragrance and abundant nectar which attracts insects.