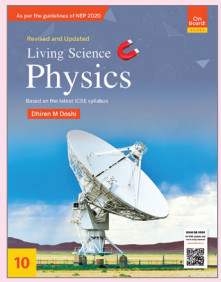
ICSE Living Science PHYSICS

Class 10



Multiple-Choice Questions

Chapter 3: SIMPLE MACHINE

1. For an ideal machine, the ratio of mechanical advantage to the velocity ratio is
   (a) greater than 1.
   (b) less than 1.
   (c) equal to 1.
   (d) depends on the value of load.
   Ans: (c)

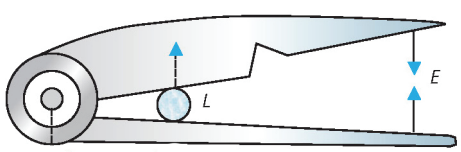
2. Which of the following statements for a machine are correct?
   (i) Efficiency of a machine has no unit as it is a ratio.
   (ii) Mechanical advantage is the ratio of the effort to the load.
   (iii) For an ideal machine, work output = work input.
   (iv) The velocity ratio of a machine is the ratio of the velocity of the effort to the velocity of the load.

   Choose the correct option.
   (a) (i), (ii) and (iii) only
   (b) (i), (iii) and (iv) only
   (c) (i) and (iv) only.
   (d) (ii) and (iii) only.
   Ans: (b)

3. A lever which always has mechanical advantage less than 1 has
   (a) load between the effort and the fulcrum.
   (b) effort between the load and the fulcrum.
   (c) fulcrum between the load and effort.
   (d) effort and load act at same point.
   Ans: (b)

4. For class II levers
   (a) load is between the effort and the fulcrum.
   (b) effort is between the load and the fulcrum.
   (c) fulcrum is between the load and effort.
   (d) effort and load act at same point.
   Ans: (a)

5. A pair of nut crackers is 12 cm long. An effort of 10 gf is required to crack a nut which is passed at a point 3 cm from the finger.



   Based on this information, answer the following questions.
   (A) The mechanical advantage of the nut cracker is
   (a) 3 (b) 4 (c) 36 (d) 6
   Ans: (b)

(B) Load of the nut cracker is equal to

(a) 30 gf (b) 2.5 gf (c) 40 gf (d) 20 gf

Ans: (c)

6. Which type of levers have mechanical advantage always more than 1?

(a) Class I levers (b) Class II levers (c) Class III levers (d) None of these

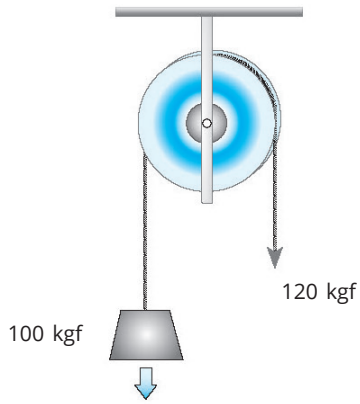
Ans: (b)

7. The human forearm acts like a lever of

(a) first order. (b) second order. (c) third order. (d) None of these.

Ans: (a)

8. The figure shows a single fixed pulley. A man puts effort 120 kgf on this pulley and lifts a load of 100 kgf by 2 m.



Based on above information, answer the following.

(A) Mechanical advantage of the pulley is

(a) 0. 45 (b) 0.43 (c) 0.83 (d) 0.85

Ans: (c)

(B) Velocity ratio of the pulley is

(a) 2 (b) 1 (c) 3 (d) 4

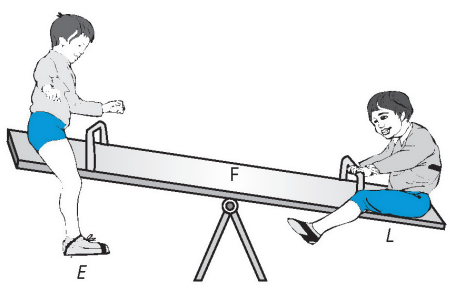
Ans: (b)

(C) Efficiency of the pulley is

(a) 80% (b) 85% (c) 83% (d) 100%

Ans: (c)

9. The uniform plank of a see-saw is 8 m long. A boy weighing 50 kgf sits at a distance of 2 m from the fulcrum. Where must another boy weighing 20 kgf sit, so as to balance the plank?



(a) 4 m (b) 5 m (c) 2.5 m (d) 3 m

Ans: (b)

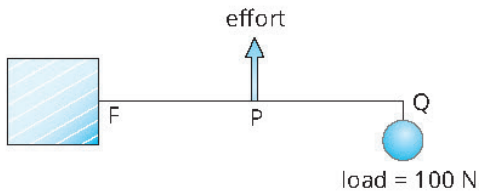
[Hint: (50 × 2)/20 = 5]

10. The mechanical advantage of an inclined plane is always

(a) greater than 1.
(b) less than 1.
(c) equal to 1.
(d) depends on the value of load.

Ans: (b)

11. The diagram given shows a simplified form of a lever.



Answer the following questions based on above information.

(A) To which class of lever does it belong?

(a) Class I levers (b) Class II levers (c) Class III levers (d) None of these

Ans: (c)

(B) Which of the following belongs to this category of levers?

(a) Bottle opener
(b) Fire tongs
(c) Pliers
(d) Oar used for rowing a boat

Ans: (b)

(C) If FP = 5 cm and PQ = 95 cm, then the effort required to lift the load is

(a) 1900 N (b) 1500 N (c) 1200 N (d) 2000 N

Ans: (d)

12. For greater efficiency of a block and tackle pulley system

(a) the lower block should be of negligible weight.
(b) the upper and lower blocks should be of equal weights.
(c) the lower block should be heavier than upper block.
(d) the weight of rope should be equal to the weight of pulleys.

Ans: (a)

13. The ideal mechanical advantage of a lever in which the effort arm is 60 cm and the load arm is 4 cm is

(a) 10 (b) 15 (c) 20 (d) 7.5

Ans: (b)

[Hint: MA = Effort arm/Load arm = 60/4 = 15]

14. In which condition/s the lever act as a speed multiplier?

(a) When the effort arm is shorter than the load arm and MA < 1.
(b) When the effort arm is longer than the load arm and MA > 1.
(c) When the effort arm is shorter than the load arm and MA > 1.
(d) When the effort arm is longer than the load arm and MA < 1.

Ans: (a)

15. A shears used for cutting a metal sheet has its blade 7 cm long while its handle is 14 cm long. If a force of 10 kgf is required to cut the metal sheet, what effort is applied to cut the sheet?

(a) 7 kgf (b) 8 kgf (c) 5 kgf (d) 10 kgf

Ans: (c)

[Hint: M.A. = Effort arm/Load arm = 14/7 = 2

Effort = Load/MA = 10 kgf/2 = 5 kgf]

16. Which of the following is matched incorrectly?

(a) See-saw: Class I Levers
(b) A nut cracker: Class II Levers
(c) Fire tongs: Class I Levers
(d) Bread knife: Class III Levers

Ans: (c)

17. Which of the following statements is not true about a pulley?

(a) A single fixed pulley is one which is fixed to a support.
(b) A single movable pulley is not fixed to any support.
(c) A movable pulley doubles the effort we exert.
(d) A single movable pulley acts as a speed multiplier.

Ans: (d) (Hint: A single movable pulley acts as a force multiplier.)

18. The correct relationship between the mechanical advantage (MA), the velocity ratio (VR), and the efficiency (η) is

(a) MA = η × VR (b) VR = η × MA (c) η = VR × MA (d) None of these

Ans: (a)

19. A single movable pulley has

(a) velocity ratio 2, and actual mechanical advantage less than 2
(b) velocity ratio 2, and actual mechanical advantage 2
(c) velocity ratio 2, and actual mechanical advantage more than 2
(d) velocity ratio less than 2, and actual mechanical advantage more than 2

Ans: (b)

20. For such levers if the effort arm is longer than the load arm then which of the following statement/s is/are true?

(i) The mechanical advantage is greater than 1.
(ii) Mechanical advantage is less than 1.
(iii) Such levers are used as force multipliers.
(iv) Such levers are used as speed multipliers.

Choose the correct option.

(a) (i) and (iii) only (b) (ii) and (iv) only (c) (i) and (iv) only (d) (ii) and (iii) only

Ans: (a)

21. Which of the following statements is not true for a machine?

(a) It always has efficiency less than 100%.
(b) Its mechanical advantage can be less than 1.
(c) It can also be used as a speed multiplier.
(d) It can have a mechanical advantage greater than the velocity ratio.

Ans: (d)

22. A man can open a nut by applying a force of 60 kgf by using a lever of handle 0.4 m. What should be the length of the lever of another handle if the force required to open the nut is 30 kgf?

(a) 1 m (b) 1.2 m (c) 0.8 m (d) 0.25 m

Ans: (d)

[Hint: 30 kgf × Effort arm in case (ii) = 60 × 0.4 m

∴ Effort arm in case (ii) = (60 × 0.4 m)/30 = 0.8 m]