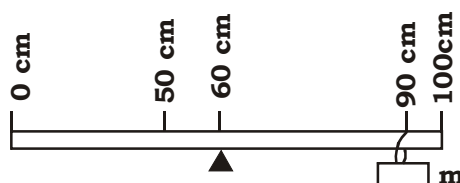
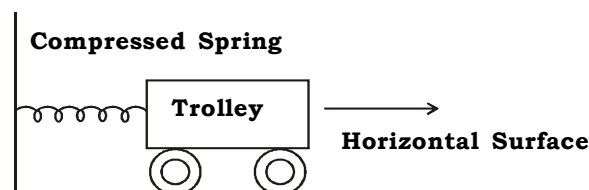


Force, Work Energy and Power, Machine (Numericals)
Assignment Sheet

1. If the power of motor is 40 kW, at what speed can it raise a load of 20,000N ? **[ICSE 2003]**
2. The weight of two bodies are 2.0 N and 2.0 kgf respectively. What is the mass of each body ? ($g = 9.8\text{ms}^{-2}$) **[ICSE 2003]**
3. A ball of mass 0.20kg is thrown vertically upwards with an initial velocity of 20 ms^{-1} . Calculate the maximum potential energy it gains as it goes up. **[ICSE 2004]**
4. A woman draws water from a well using a fixed pulley. The mass of the bucket and water together is 6.0kg. The force applied by the woman is 50 N. Calculate the mechanical advantage. **[ICSE 2004]**
5. Two balls of mass ratio 1 : 2 are dropped from the same height.
(i) State the ratio between their velocities when they strike the ground.
(ii) The ratio of the forces acting on them during motion. **[ICSE 2004]**
6. The work done by the heart is 1 joule per beat. Calculate the power of the heart if it beats 72 times in 1 minute. **[ICSE 2005]**
7. A pulley system has a velocity ratio of 4 and an efficiency of 90%. Calculate
(i) the mechanical advantage of the system.
(ii) the effort required to raise a load of 300 N by the system. **[ICSE 2006]**
8. Calculate the height through which a body of mass 0.5kg should be lifted if the energy spent for doing so is 1.0 joule. [$g = 10\text{ ms}^{-2}$] **[ICSE 2006]**
9. Two bodies, A and B of equal mass are kept at heights 20 m and 30 m respectively. Calculate the ratio of their potential energies. **[ICSE 2007]**
10. A uniform metre scale is kept in equilibrium when supported at the 60cm mark and mass m is suspended from 90cm mark as shown in the figure. State with reasons, whether the weight of the scale is greater than, less than, or equal to the weight of the mass m . **[ICSE 2007]**



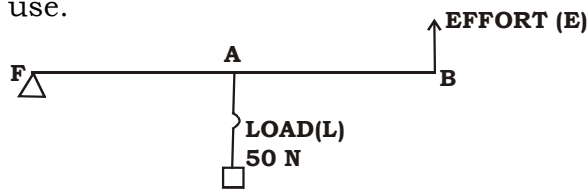
11. A body of mass 1.50kg is dropped from the 2nd floor of a building which is at a height of 12m. What is the force acting on it during its fall ?
($g = 9.8\text{ms}^{-2}$) **[ICSE 2008]**
12. (i) A stone of mass 64.0 g is thrown vertically upward from the ground with an initial speed of 20.0ms^{-1} . The gravitational potential energy at the ground level is considered to be zero. Apply the principle of conservation of energy and calculate the potential energy at the maximum height attained by the stone. [$g = 10\text{ms}^{-2}$]
(ii) Using the same principle, state what will be the total energy of the body at its half-way point. **[ICSE 2008]**
13. A body of mass 5kg is moving with a velocity of 10ms^{-1} . What will be the ratio of its initial kinetic energy and final kinetic energy, if the mass of the body is doubled and its velocity is halved ? **[ICSE 2009]**
14. 6.4 kJ of energy causes displacement of 64m in a body in the direction of force in 2.5s. Calculate :
(a) the force applied
(b) power in horsepower (HP). [Take HP = 746 W] **[ICSE 2009]**
15. A body of mass 50 kg has a momentum of 3000kg ms^{-1} . Calculate:
(i) the kinetic energy of the body.
(ii) the velocity of the body. **[ICSE 2010]**
16. A spring is kept compressed by a small trolley of mass 0.5 kg lying on a smooth horizontal surface as shown in the figure given below :



- when the trolley is released, it is found to move at a speed of 2ms^{-1} . What potential energy did the spring possess when compressed? **[ICSE 2010]**
17. A boy weighs 360 N on the earth
(i) What would be his approximate weight on the moon?
(ii) What is the reason for your answer? **[ICSE 2010]**
18. A ball of mass 200g falls from a height of 5 m. What will be its kinetic energy when it just reaches the ground ? ($g = 9.8\text{ms}^{-2}$) **[ICSE 2011]**
19. A man can open a nut by applying a force of 150 N by using a lever handle of length 0.4 m. What should be the length of the handle if he is able to open it by applying a force of 60 N ? **[ICSE 2011]**

20. A uniform metre scale can be balanced at the 70.0 cm mark when a mass of 0.05 kg is hung from the 94.0 cm mark.
 (i) Draw a diagram of the arrangement.
 (ii) find the mass of the metre scale. **[ICSE 2011]**

21. The diagram below shows a lever in use.
 (i) To which class of lever does it belong ?
 (ii) If $FA = 40\text{cm}$, $AB = 60\text{cm}$, then find the mechanical advantage of the lever. **[ICSE 2011]**



22. A moving body weighing 400 N possesses 500 J of kinetic energy. Calculate the velocity with which the body is moving, ($g = 10 \text{ ms}^{-2}$) **[ICSE 2012]**
23. A boy of mass 30 kg is sitting at a distance of 2 m from the middle of a see-saw. Where should a boy of mass 40 kg sit so as to balance the see-saw? **[ICSE 2012]**

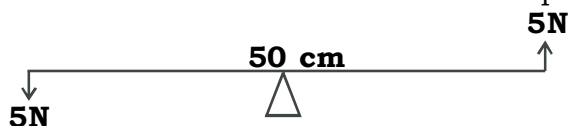
24. A body of mass 0.2 kg falls from a height of 10 m to a height of 6 m above the ground. Find the loss in potential energy taking place in the body. ($g = 9.8\text{ms}^{-2}$) **[ICSE 2012]**

25. A force is applied on body of mass 20kg moving with velocity of 40ms^{-1} . The body attains a velocity of 50ms^{-1} in 2 seconds. Calculate work done by the body. **[ICSE 2013]**

26. A girl of mass 35kg climbs up from first floor of a building at a height 4m above the ground to the third floor at height 12m above the ground. What will be the increase in her gravitational potential energy. ($g= 10\text{ms}^{-2}$) **[ICSE 2013]**

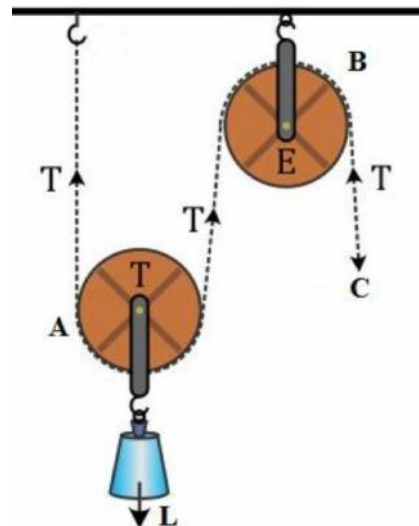
27. A coolie is pushing a box weighing 1500 N up an inclined plane 7.5m long on to a platform 2.5m above the ground
 (i) Calculate the mechanical advantage of inclined plane
 (ii) Calculate the effort applied by the coolie.
 (iii) In actual practice, the coolie needs to apply more effort than what is calculated. Give one reason why you think the coolie needs to apply more effort. **[ICSE 2013]**

28. (i) A man having a box on his head, climbs up a slope and another man having an identical box walks the same distance on a levelled road. Who does more work against the force of gravity and why?
 (ii) Two forces each of 5N act vertically upwards and downwards respectively on the two ends of a uniform metre rule which is pivoted at its mid-point as shown in the diagram. Determine the magnitude of the resultant moment of these forces about the midpoint. **[ICSE 2014]**



29. Calculate the change in the Kinetic energy of a moving body if its velocity is reduced to $1/3^{\text{rd}}$ of the initial velocity. **[ICSE 2014]**
30. Rajan exerts a force of 150 N in pulling a cart at a constant speed of 10 ms^{-1} . Calculate the power exerted. **[ICSE 2015]**
31. A nut is opened by a wrench of length 20cm. If the least force required is 2N, find the moment of force needed to loosen the nut. **[ICSE 2015]**
32. A block and tackle system has V.R. = 5.
 (i) Draw a neat labelled diagram of a system indicating the direction of its load and effort.
 (ii) Rohan exerts a pull of 150 Kgf. What is the maximum load he can raise with this pulley system if its efficiency = 75%? **[ICSE 2015]**
33. Rajan exerts a force of 150 N in pulling a cart at a constant speed of 10 m/s. Calculate the power exerted. **[ICSE 2015]**
34. A nut is opened by a wrench of length 20cm. If the least force required is 2N, find the moment of force needed to loosen the nut. **[ICSE 2015]**
35. A boy weighing 40 kgf climbs up a stair of 30 steps each 20 cm high in 4 minutes and a girl weighing 30 kgf does the same in 3 minutes. Compare:
 (i) The work done by them.
 (ii) The power developed by them. **[ICSE 2016]**
36. From the diagram given, answer the questions that follow:

- (i) What kind of pulleys are A and B?
 (ii) State the purpose of pulley B.
 (iii) What effort has to be applied at C just raise the load $L = 20 \text{ kgf}$?
(Neglect the weight of pulley A and friction)

[ICSE 2016]

37. (i) An effort is applied on the bigger wheel of a gear having 32 teeth. It is used to turn a wheel of 8 teeth. Where it is used.
 (ii) A pulley system has three pulleys. A load of 120 N is overcome by applying an effort of 50N. Calculate the Mechanical Advantage and Efficiency of this system. **[ICSE 2016]**

38. A uniform half metre rule balances horizontally on a knife edge at 29 cm mark when a weight of 20 gf is suspended from one end.
- Draw a diagram of the arrangement.
 - What is the weight of the half metre rule? **[ICSE 2017]**
39. If the power of a motor be 100 kW, at what speed can it raise a load of 50,000 N? **[ICSE 2017]**
40. A boy uses a single fixed pulley to lift a load of 50 Kgf to some height. Another boy uses a single movable pulley to lift the same load to the same height. Compare the effort applied by them. Give a reason to support your answer. **[ICSE 2017]**
41. A pulley system with $VR = 4$ is used to lift a load of 175 kgf through a vertical height of 15 m. The effort required is 50 kgf in the downward direction. ($g = 10 \text{ N kg}^{-1}$)
Calculate:
- Distance moved by the effort.
 - Work done by the effort.
 - M.A. of the pulley system.
 - Efficiency of the pulley system. **[ICSE 2017]**

