Work Conceptual Questions

Multiple choice Questions

Question 1: A box falls from rest through the atmosphere (friction is present) gaining 20 J of Kinetic Energy. How much gravitational potential energy did it lose?
a) 20 J.
b) More than 20 J.
c) Less than 20 J.
d) Not sufficient information

Solution -1 (b)
Explanation

$$W_c + W_f = \Delta KE$$

Or

$$W_c = \Delta KE - W_f$$

Now change in Kinetic energy=20 J
Work done by the friction will be in opposite direction of motion, so negative
So Total work done by gravitational force will be force then 20 J

Question 2: You have two springs A and B of spring constant k_1 and k_2 ($k_1 > k_2$). Please pick the correct statement
(A) If the both the springs are stretched with same force, More work will be done in spring B
(B If the both the springs are stretched with same force, More work will be done in spring A
(C) if the both the springs are stretched to same distance, More work will done in spring A
(D) if the both the springs are stretched to same distance, More work will done in spring B

Solution -2 (a) and (c)

Explanation
With Same force, Spring A will be less stretched as it has more spring constant, So work done is more in spring B
With same distance stretching, since the spring A is stiffer, more work will be required in that case.

True or False statement

3) Centripetal force does not do any work on the object
4) A particle moves from point A to point B under the influence of force and then from point B to A .Network done by force is non zero. The force is conservative in nature

5) The negative of work done by the conservative force is equal to change in Potential energy
6) Can the work done by the kinetic friction be positive?
7) The work done by all the force (external and internal) on a system equal the change in total energy

Solution 3 (True)
Explanation
Centripetal force is always perpendicular to the motion. So displacement and force will have 90^0 always and work done will be zero

Solution 4 (false)
Explanation
Since the work done in the cycle is not zero, it is not a conservative force

Solution 5 (True)
Explanation
We know that

$$\Delta U = -W$$

Solution 6 (True)
Explanation

We have a situation where dishes are present on tablecloth and the tablecloth is pulled from under the dishes, the relative motion is for the dishes to be left behind as the tablecloth is pulled, and so the kinetic friction opposes that and moves the dishes in the same direction as the tablecloth. This is a force that is in the direction of displacement, and so positive work is done. Also note that the cloth is moving faster than the dishes in this case, so that the friction is kinetic, not static.

Solution 7 (False)
Explanation
Work done by the all forces (external + internal) =change in KE

Link Type comprehension

You lift a box from the ground and kept on the table.
Question 8 Power to lift the box does not depend on?
a) Path taken by the box assuming time taken is same in all paths
b) Time taken to lift the box
c) Height of the table
d) Weight of the box

Question 9 Work done to lift the box depend on ?
a) Path taken by the box
b) Time taken to lift the box
c) Height of the table
d) Your weight

Question 10 Gravitational energy gained in box will depend on ?
a) path taken by the box
b) time taken
c) Height of the table
d) Weight of the box

Solution 8-10

Explanation:

Three facts here we know
i)Power =Work /time taken, So power depends on both work and time taken
ii) Work does not depend on path taken if no non conservative force is doing work
iii) Work done is equal to change in PE of the box which depends on box weight and height of the table
Based on above, we can easily derive that Power does not depend on different path provide the time taken is same. Powers do depend on Time taken and since work depend on weight of the box and height of the table, Power also depends on it.
Work done does not depend on time taken, path and weight of the your body but it does depend on the height of the table
Gravitational PE is equal to mgH.So it depends on height of the table and weight of the table only
8) a
9) c
10) c ,d

Multiple choice Questions

Question 11 A ball is dropped from height H and it is falling free under the influence of gravity. Which are these is incorrect

a) The net work done by the forces on the ball is zero
b) The kinetic energy increase and PE decrease through out the motion
c) KE increase by equal amount in equal distance
d) Potential energy decrease by equal amount in equal time
e) KE increase by equal amount in equal time.

Solution 11 (a),(d) ,(e)
Explanation
The force of gravity performs the work on ball and that is only force acting. And it is non zero
As the body falls KE increase and PE decrease

Change in KE = Change in Potential energy = Potential decrease by equal amount in equal distance, So KE increase by equal amount in equal time.
Potential energy and KE is both proportional to square of time, so they do not in increase or decrease equally with equal time

Link Type comprehension

A block of Mass M is lifted to the height H and it is kept there
Question 12 How much work is being done to keep it in the same position
a) W=0
b). W=mgH
c) W > Mgh
d) W < mgh

Solution -12 (0)
Explanation

Work done is zero as there is no displacement

Question 13 How much work is done in lifting it to height from the ground. Assume Air friction to be negligible
a) W=0
b). W=mgH
c) W > Mgh
d) W < mgh

Solution -13 (b)
Explanation

Work done is change in the PE of the object

Question 14 How much work is done in lifting it to height from the ground. Assume Air friction to be present
a) W=0
b). W=mgH
c) W > Mgh
d) W < mgh

Solution 14 (c)

Explanation

When friction is present, some work is lost in air friction, W > mgH