KVS RO BPL(CLASS XI CBT-PHYSICS OCTOBER 2023-24)

QUESTION PAPER FOR CLSASS XI CBT OCTOBER 2023-24

CLASS :-XI

SUBJECT :-PHYSICS

TOPIC :- WORK ENERGY AND POWER, SYSTEM OF PARTICLES AND ROTATIONAL MOTION

CASE STUDY – I

WORK ENERGY AND POWER

Work is said to be done by force acting on a body, provided the body is displaced actually in any direction except in a direction perpendicular to the direction of the force. Mathematically,

$W = \vec{F} \cdot \vec{S} = FS\cos\theta$. Where energy is capacity of a body to do the work: power is the rate at which the body can do the work. $P = W/t = \vec{F} \cdot \frac{\vec{s}}{t} = \vec{F} \cdot \vec{v}$

Both, work and energy are measured in joule and power is measured in Watt.

With the help of the comprehension given above, choose the correct alternatives for each of the following questions.

Q1. **A box is pushed through 4.0 m across a floor offering 100 N resistance. Work done by the applied force is** *

- (a) 400 J
- (b) -400J
- (c) 25J
- (d) 0.04 J

Ans - a

Feedback : work done = force * distance = 4 *(100) =-400 J

Q2. **In the above question, work done by the resisting force is** *

- (a) 400J
- (b) -400J

(c) 25J

(d) -25J

Ans - b

Feedback - resisting force is negative of applied force so work done = -400 J

Q3. **In the above question, work done by gravity is** *

(a) 400J

(b) -400J

(c) zero

(d) -25J

Ans - c

Feedback - As there is no vertical displacement of box, so work done by gravity is zero.

Q4. **A truck draws a tractor of mass 1000 kg at a steady rate of 20 m/s on a level road. The tension in the coupling is 2000 N. power spent on the tractor is** *

(a) 40W

(b) 20W

(c) 20kW

(d) 40kW

Ans - d

Feedback - power = Force * velocity = 2000 * 20 = 40000 W = 40 kW

CASE STUDY – II

SYSTEM OF PARTICLES AND ROTATIONAL MOTION

The centre of mass of a body is a point at which the entire mass of the body is supposed to be concentrated. The position vector $\vec{r}$ of centre of mass of the system of two particles of masses m_1 and m_2 with position vectors $\vec{r}_1$ and $\vec{r}_2$ is given by $\vec{r} = \frac{m1\vec{r}1+m\vec{r}2}{m1+m2}$

For an isolated system, where no external force is acting, $\vec{V}_{cm}$ = constant

Under no circumstances, the velocity of centre of mass of an isolated system can undergo a change.

With the help of the comprehension given above, choose the correct alternatives for each of the following questions.

Q5. **Two bodies of masses 1 kg and 2 kg are located at (1,2) and (-1,3) respectively. The co-ordinates of centre of mass are:** *

(a) (-1,3)

(b) (1,2)

(c) (-1/3,8/3)

(d)(1/3,-8/3)

Ans - C

Feedback - coordinates : $X= (m_1x_1 + m_2x_2)/(m_1+m_2) = [1*1 +2*(-1)]/(1 +2) = -1/3$

$Y= (m_1y_1 + m_2y_2)/(m_1+m_2) = [1*2 +2*(3)]/(1 +2) = 8/3$

Q6. **Two blocks of masses 5 kg and 2 kg are placed on a frictionless surface and connected by a spring. An external kick gives velocity of 14 m/s to heavier block in the direction of lighter one. The velocity gained by centre of mass is** *

(a) 14 m/s

(b) 7 m/s

(c) 12 m/s

(d) 10 m/s

Ans -d

Velocity of CM : v_{cm} = (m1v1 + m2v2)/ (m1 + m2) = (14*5 + 0*2)/(5+2) = 70/7 = 10 m/s

Q7. **An electron and proton move towards each other with velocities v1 and v2 respectively. The velocity of their centre of mass is** *

(a)Zero

(b) v1

(c) v2

(d) (v1+v2)/2

Ans - c

Feedback - velocity of centre of mass = (m1v1 +m2v2)/(m1+m2)
Since electron has negligible mass so neglecting terms containing m1
Velocity = m2v2/m2 = v2

Q8. **A bomb dropped from an aeroplane in level flight explodes in the middle. The centre of mass of fragments** *

(a) Is at rest

(b) Moves vertically downwards

(c) Moves vertically upwards

(d) Continues to follow the same parabolic path which it would have followed if there was no explosion.

Ans -d

Feedback - As forces involved are internal forces, so there is o change in the motion of CM

Assertion and Reasoning

Q9. **Assertion:** Work done by the centripetal force in moving a body along a circle is always zero. *

Reason: Because displacement of the body is along the force.

(a) both assertion and reason are true and reason is the correct explanation of assertion.

(b) both assertion and reason are true but reason is not the correct explanation of assertion.

(c) assertion is true but reason is false.

(d) both assertion and reason are false.

Ans -c

Feedback - Assertion is correct as centripetal force does no work on object
Reason is wrong as displacement in circular path is perpendicular to force.

Q10. **Assertion:** When ice on polar caps of earth melts, duration of day increases. *

Reason: Because angular momentum is constant.

(a) both assertion and reason are true and reason is the correct explanation of assertion.

(b) both assertion and reason are true but reason is not the correct explanation of assertion.

(c) assertion is true but reason is false.

(d) both assertion and reason are false.

Ans - a

Feedback - assertion is correct - as ice melts, water flows out and mass of water spread out, then moment of inertia increases.
Reason is correct because as per L = Iω, when I increases, angular speed decreases, so day increases.

Answer Key OCTOBER Month CBT Physics XI

Q No	Answer
1	a
2	b
3	c
4	d
5	c
6	d
7	a
8	d
9	c
10	a

Feedback:

1. Average score in this test is 5.24/10
2. Question 1,3 and 5 are scored by most of the students.
3. Question 7 and 9 is scored by least No of students.
4. Median marks scored by students is 5