# JB 2 MR BATCH (SET A)
PHYSICS : DCT
Topics: Work Energy Power

1. A car mass 1000 kg accelerates uniformly from rest to a velocity of 54 km/h in 5 s. The average power of the engine during this speed is (neglect friction):

   (a)   2000 W   (b)   45000 W   (c)   2250 W   (d)   22500 W

2. A particle moves on a rough horizontal ground with some initial velocity say v_0. If (3/4)th of its kinetic energy is lost in friction in time t_0, then coefficient of friction between the particle and the ground is:

   (a) $\dfrac{v_0}{2gt_0}$ (b) $\dfrac{v_0}{4gt_0}$ (c) $\dfrac{3v_0}{4gt_0}$ (d) $\dfrac{v_0}{gt_0}$

3. If a number of forces act on a body and the body is in static or dynamic equilibrium, then:

   (a)   work done by any individual force must be zero

   (b)   net work done by all the forces is +ve

   (c)   net work done by all the force is –ve

   (d)   net work done by all the forces is zero

4. A body of mass m kg is lifted by a man to a height of one metre in 30 s. Another man lifts the same mass to the same height in 60 s. The work done by them are in the ratio

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

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5. A force $F = (5\hat{i} + 3\hat{j})$ newtons is applied over a particle which displaces it form its origin to the point $r = (2\hat{i} - 1\hat{j})$ metres. The work done on the particle is

    (a) -7 joules   (b) $+13$ joules   (c) $+7$ joules   (d) $+11$ joules

6. A particle moved from position $\vec{r_1} = 3\hat{i} + 2\hat{j} - 6k$ to position $\vec{r_2} = 14\hat{i} + 13\hat{j} + 9k$ under the action of a force $(4\hat{i} + \hat{j} + 3k)$ newtons. Find the work done.

    (a)   10 J   (b)   100 J   (c)   0.01 J   (d)   1 J

7. The work done by the force $= \vec{F} = A(y^2\hat{i} + 2x^2\hat{j})$, where A is a constant and x and y are in meters around the path shown is:
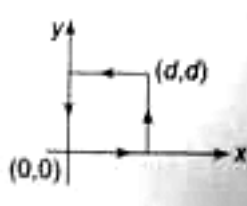
    (a)   zero   (b)   Ad   (c) Ad^2 (d) Ad^3

8. A body of mass m is slowly pulled up the hill by a force F which at each point was directed along the tangent of the trajectory as shown in figure. All surfaces are smooth. Find the work performed by this force.
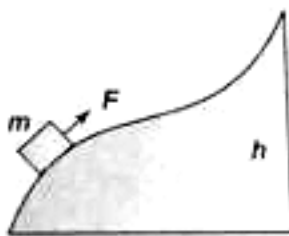

    (a)   mg$l$ (b) $-$mg$l$ (c)   mgh   (d)   zero


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9. A block of mass 2 kg is dropped from a height of 40 cm on a spring whose force-constant is 1960 Nm^{-1}. The maximum distance through which the spring is compressed by

   (a) 5 cm (b) 15 cm (c) 20 cm (d) 10 m

10. A slab S of mass m is released from a height h_0 from the top of a spring of force constant k. The maximum compression x of the spring is given by the equation
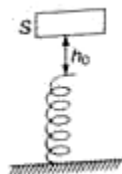

   (a) $mgh_0 = \dfrac{1}{2}kx^2$ (b) $mg(h_0 - x) = \dfrac{1}{2}kx^2$

   (c) $mgh_0 = \dfrac{1}{2}k(h_0 + x)^2$ (d) $mg(h_0 + x) = \dfrac{1}{2}kx^2$

11. A pump is required to lift 800 kg of water per minute from a 10 m deep well and eject it with speed of 20 m/s. The required power in watts of the pump will be

   (a) 6000 (b) 4000 (c) 5000 (d) 8000

12. A ball is dropped onto a floor a height of 10 m. If 20% of its initial energy is lost, then the height of bounce is

   (a) 2 m (b) 4 m (c) 8 m (d) 6.4 m

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13. A system of wedge and block as shown in figure, is released with the spring in its natural length. All surfaces are frictionless. Maximum elongation in the spring will be
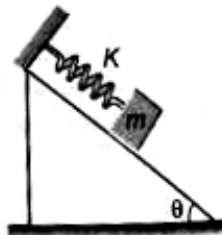
(a) $\dfrac{2mg \sin \theta}{K}$ (b) $\dfrac{mg \sin \theta}{K}$ (c) $\dfrac{4mg \sin \theta}{K}$ (d) $\dfrac{mg \sin \theta}{2K}$

14. A body of mass m is released from a height h on a smooth inclined plane that is shown in the figure. The following can be true about the velocity of the block knowing that the wedge is fixed
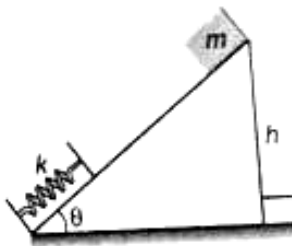
(a) v is highest when it just touches the spring

(b) v is highest when it compresses the spring by some amount

(c) v is highest when the spring comes back to natural position

(d) v is highest at the maximum compression

15. A spring of spring constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. The work required to further stretch the spring by another 5 cm is

(a) 6.25 N-m   (b) 12.50 N-m   (c) 18.75 N-m   (d) 25.00 N-m

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16. Atomic number and mass number of an element M are 25 and 52 respectively. The number of electrons, protons and neutrons in M^{+2} ion are respectively

   (a) 25, 25 and 27   (b) 25, 27 and 25   (c) 27, 25 and 27   (d) 23, 25 and 27

17. The number of orbitals in the fourth principal quantum number will be

   (a) 4   (b) 8   (c) 12   (d) 16

18. The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy per atom will be

   (a) 2.0×10^{-20} J   (b) 2.2×10^{-19} J   (c) 2.0×10^{-19} J   (d) 4.0×10^{-20} J

19. Which of the following 3d orbitals has electron density along all three axes?

   (a) $3d_{xy}$ (b) $3d_{yz}$ (c) $3d_{z^2}$ (d) $3d_{zx}$

20. The number of nucleons in chlorine-37 is

   (a) 17   (b) 20   (c) 54   (d) 37

21. Planck's constant has the same dimensions as that of

   (a) power   (b) work   (c) radiant energy   (d) angular momentum

22. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?

   (a) Lyman series   (b) Balmer series   (c) Paschen series   (d) Brackett series

23. The ratio of ionization energy of H and Be^{+3} is

   (a) 1 : 4   (b) 1 : 8   (c) 1 : 16   (d) 16 : 1

24. O_2^{2-} is the symbol of .... ion.

   (a) Oxide   (b) Super   (c) Peroxide   (d) Monoxide

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25. Statement I: NaNO$_3$ has no definite molecule.

Statement II: Its formula mass is 85.

(a) If Statement I is true, Statement II is true, Statement II is the correct explanation of statement I.

(b) If Statement I is true, Statement II is true, Statement II is not the correct explanation for Statement I.

(c) Statement I is true but statement II is false.

(d) Statement I is false but statement II is true.

26. Which of the following is a compound

(a) Diamond   (b) Salt + H$_2$O   (c) Washing soda   (d) Ca

27. Physical state of water at 273 K is

(a) Solid   (b) Liquid   (c) Gas   (d) Both (a) and (b)

28. The outer most orbit of an element X is partially filled with electrons in 's' and 'p' subshells. The element is

(a) An inert gas   (b) A representative element

(c) A transition element   (d) An inner transition element

29. A member of Lanthanide

(a) Caesium   (b) Lanthanum   (c) Neoybium   (d) Lutetium

30. Match the following.

Type-I Series	Type-II Elements
A) 3d	1) Sc (21) to Zn (30)
B) 4d	2) La (57), Hf (72) to Hg (80)
C) 5d	3) Y (39) to Cd (48)
D) 6d	4) Ac (89), Rf (104) to Mt (109)

(a) A-l, B-3, C-2, D-4   (b) A-2, B-3, C-l, D-4   (c) A-3, B-1, C-2, D-4   (d) A-4, B-2, C-3, D-1

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PHYSICS : DCT SET - A ANSWER KEY
Topics: Work Energy Power

1.	(d)	2.	(a)	3.	(d)	4.	(b)	5.	(c)
6.	(b)	7.	(d)	8.	(c)	9.	(d)	10.	(d)
11.	(b)	12.	(c)	13.	(a)	14.	(b)	15.	(c)

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CHEMISTRY : DCT SET - A ANSWER KEY
Topic: Atomic Structure + Mole Concept + Periodic

16.	(d)	17.	(d)	18.	(a)	19.	(c)	20.	(d)
21.	(d)	22.	(b)	23.	(c)	24.	(c)	25.	(b)
26.	(c)	27.	(d)	28.	(b)	29.	(d)	30.	(a)