

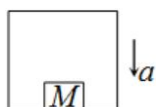


Max Marks: 60

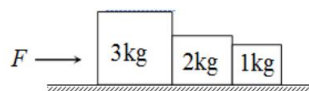
Date: 28.08.2022

JB 1 MR BATCH
PHYSICS : DCT
Topic: Relative Motion and NLM

1. With what acceleration 'a' should the box in the figure descend so that the block of mass M exerts a force $Mg/4$ on the floor of the box?



- (a) $g/4$ (b) $g/2$ (c) $3g/4$ (d) $4g$
2. Consider the following statement about the blocks shown in the diagram that are being pushed by a constant force on a frictionless table.



- A. All blocks move with the same acceleration.
B. The net force on each block is the same

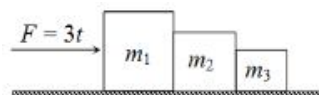
Which of these statement are/is correct?

- (a) A only (b) B only (c) both A and B (d) neither A nor B
3. A body of mass 2 kg moves vertically downwards with an acceleration $a = 19.6 \text{ m/s}^2$. The force acting on the body simultaneously with the force of gravity is ($g = 9.8 \text{ m/s}^2$ neglect air resistance)
- (a) 19.6 N (b) 19.2 N (c) 59.2 N (d) 58.8 N

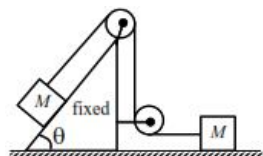
Space for Rough Work



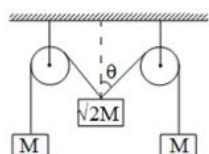
4. A time dependent force $F = 3t$ (F in Newton and t in second) acts on three blocks m_1 , m_2 and m_3 kept in contact on a rough ground as shown. Co-efficient of friction between blocks and ground is 0.4. If m_1 , m_2 and m_3 are 3 kg, 2 kg and 1 kg respectively, the time after which the blocks start to move is ($g = 10 \text{ ms}^{-2}$)



- (a) 4 sec (b) 8 sec (c) $\frac{8}{3}$ sec (d) $\frac{4}{3}$ sec
5. Two blocks, each having a mass M , rest on frictionless surface as shown in the figure. If the pulleys are light and frictionless, and M on the incline is allowed to move down, then the tension in the string will be



- (a) $\frac{2}{3} Mg \sin \theta$ (b) $\frac{3}{2} Mg \sin \theta$ (c) $\frac{Mg \sin \theta}{2}$ (d) $2 Mg \sin \theta$
6. A body of mass m is kept stationary on a rough inclined plane of inclination θ . The magnitude of force acting on the body by the inclined plane is
- (a) mg (b) $mg \sin \theta$ (c) $mg \cos \theta$ (d) $mg\sqrt{1 + \cos^2 \theta}$
7. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be:



- (a) 0° (b) 30° (c) 45° (d) 60°

Space for Rough Work



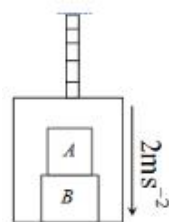
8. A block of metal weighing 2 kg is resting on a frictionless plane. It is struck by a jet of water at a rate of 1 kgs^{-1} at a speed of 5 ms^{-1} . The initial acceleration of the block is

(a) $\frac{2}{5} \text{ ms}^{-2}$ (b) $\frac{5}{2} \text{ ms}^{-2}$ (c) 5 ms^{-2} (d) $\frac{1}{5} \text{ ms}^{-2}$

9. A block of mass m is attached to a massless spring of spring constant K . This system is accelerated upward with acceleration a . The elongation in spring will be

(a) $\frac{mg}{K}$ (b) $\frac{m(g-a)}{K}$ (c) $\frac{m(g+a)}{K}$ (d) $\frac{ma}{K}$

10. The elevator shown in figure is descending with an acceleration of 2 ms^{-2} . The mass of the block $A = 0.5 \text{ kg}$. The force exerted by the block A on the block B is ($g = 10 \text{ ms}^{-2}$)



(a) 2N (b) 4N (c) 6N (d) 8N

11. A man slides down a light rope whose breaking strength is η times his weight ($\eta < 1$). The maximum acceleration of the man so that the rope just breaks is

(a) $g(1 - \eta)$ (b) $g(1 + \eta)$ (c) $g\eta$ (d) $\frac{g}{\eta}$

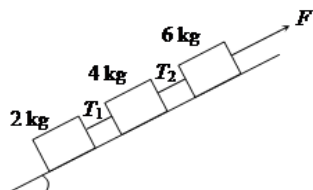
12. A body of mass 1.5 kg is thrown vertically upwards with an initial velocity of 40 m/s reaches its highest point after 3 s. The air resistance acting on the body during the ascent is (assuming air resistance to be uniform, $g = 10 \text{ m/s}^2$)

(a) 35 N (b) 25 N (c) 15 N (d) 5 N

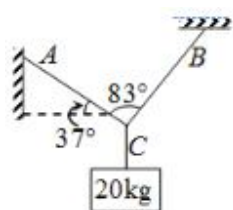
Space for Rough Work



13. Three blocks of masses 2kg, 4kg and 6kg are connected by string and resting on a frictionless incline of 53° as shown. A force of 120 N is applied upward along the incline to the 6 kg block. If the strings are ideal, the ratio T_1/T_2 will be ($g = 10 \text{ ms}^{-2}$)



- (a) 1 : 1 (b) 1 : 2 (c) 1 : 3 (d) 1 : 4
14. A block of mass 20 kg is balanced by three strings A, B & C as shown in figure. Ratio of tensions in string A and B (T_A/T_B) is



- (a) $\frac{5}{8}$ (b) $\frac{5\sqrt{3}}{8}$ (c) $\frac{5}{6}$ (d) $\frac{8}{5}$
15. A block of mass 0.1 kg is held against a wall by applying a horizontal force of 5 N on the block. If the coefficient of friction between the block and the wall is 0.5, the magnitude of the frictional force acting on the block is
- (a) 2.5 N (b) 0.98 N (c) 4.9 N (d) 0.49 N

Space for Rough Work



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**JB 1 MR BATCH
CHEMISTRY: DCT**

Topic: Periodic Properties +moles+ Oxidation

16. Ethyl alcohol is 46% by weight of solution. Hence, mole fraction of ethyl alcohol is
(a) 0.46 (b) 0.54 (c) 0.75 (d) 0.25
17. Which is temperature independent?
(a) Mass per cent (b) Volume per cent
(c) Mass/volume per cent (d) Molarity
18. The molarity of a solution obtained by mixing 750 mL of 0.5 (M) HCl with 250 mL of 2(M) HCl will be
(a) 0.875 M (b) 1.00 M (c) 1.75 M (d) 0.0975 M
19. H_2SO_4 is 98% by weight of solution. Hence, it is
(a) 1 molal (b) 10 molal (c) 50 molal (d) 500 molal
20. H_3PO_4 (d = 108 g/mL) is 18 M. Hence, mass percentage and molality are
(a) 18 , 32.4 (b) 98 , 32.4 (c) 98 , 500 (d) 98 , 18
21. 100mL of 0.01 M H_2SO_4 is neutralized by
(a) 100 mL of 0.01 M NaOH (b) 100 mL of 0.01 M $\text{Ca}(\text{OH})_2$
(c) 100 mL of 0.01 M $\text{Al}(\text{OH})_3$ (d) All the above are correct
22. Which of the following have been arranged in the decreasing order of oxidation number of sulphur?
(a) $\text{S}_2\text{O}_6^{2-} > \text{S}_2\text{O}_7^{2-} > \text{S}_2\text{O}_3^{2-} > \text{S}_8$ (b) $\text{H}_2\text{SO}_4 > \text{SO}_2 > \text{H}_2\text{S} > \text{H}_2\text{S}_2\text{O}_8$
(c) $\text{SO}_2^{2+} > \text{SO}_4^{2-} > \text{SO}_3^{2-} > \text{HSO}_4^-$ (d) $\text{H}_2\text{SO}_5 > \text{H}_2\text{SO}_3 > \text{SO}_2 > \text{H}_2\text{S}$
23. Oxidation number of potassium in K_2O , K_2O_2 and KO_2 , respectively, is
(a) +1, +4 and +2 (b) +1, +2 and +4 (c) +1, +1 and +1 (d) +2, +1 and $+\frac{1}{2}$

Space for Rough Work



24. In which case oxidation number of Cr has been affected?
- (a) $2\text{CrO}_4^{2-} + 2\text{H}^+ \rightarrow \text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O}$ (b) $\text{Cr}_2\text{O}_4^{2-} + 2\text{OH}^- \rightarrow 2\text{CrO}_4^{2-} + \text{H}_2\text{O}$
- (c) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$ (d) $\text{CrO}_2\text{Cl}_2 + 2\text{OH}^- \rightarrow \text{CrO}_4^{2-} + 2\text{HCl}$
25. Select the correct statement in the following reaction
- $\text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$
- (a) Oxidation number of N has changed from -2 to +2
- (b) Oxidation number of N in NH_4^+ changed from -3 to 0 and that in NO_2^- changed from +3 to 0
- (c) Oxidation number of N in NH_4^+ changed from +1 to 0 and that in NO_2^- changed from -1 to 0
- (d) No change
26. Which is intramolecular oxidation reduction reaction ?
- (a) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{N}_2 + \text{Cr}_2\text{O}_3 + \text{H}_2\text{O}$ (b) $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + 2\text{H}_2\text{O}$
- (c) $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$ (d) All of the above
27. Which of the following reactions is an example of a redox reaction?
- (a) $\text{XeF}_4 + \text{O}_2\text{F}_2 \rightarrow \text{XeF}_6 + \text{O}_2$ (b) $\text{XeF}_2 + \text{PF}_5 \rightarrow [\text{XeF}]^+ \text{PF}_6^-$
- (c) $\text{XeF}_6 + \text{H}_2\text{O} \rightarrow \text{XeOF}_4 + 2\text{HF}$ (d) $\text{XeF}_6 + 2\text{H}_2\text{O} \rightarrow \text{XeO}_2\text{F}_2 + 4\text{HF}$
28. If the following is balanced reaction,
- $4\text{O}_2^{x-} + 2\text{H}_2\text{O} \rightarrow 4\text{OH}^- + 3\text{O}_2$
- then x is and O_2^{x-} is
- (a) -1 and species is superoxide (b) -2 and species is peroxide
- (c) -4 and species is oxide (d) -1 and species is peroxide
29. As we proceed from top to bottom in the periodic table
- (a) hydroxides are more basic (b) oxyacids are less acidic
- (c) neither of the above (d) Both of the above
30. Electron affinity is positive when
- (a) O^- is formed from O (b) O^{2-} is formed from O^-
- (c) O^+ is formed from O (d) electron affinity is always a negative value

Space for Rough Work

JB 1 MR BATCH
PHYSICS : DCT ANSWER KEY
Topic: Relative Motion and NLM

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

JB 1 MR BATCH
CHEMISTRY: DCT ANSWER KEY
Topic: Periodic Properties + moles + Oxidation

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