PHYSICS

BOOKS - CAREER POINT

MOCK TEST 2

Part A Physics

1. A simple pendulam with a solid metal bob has a period T. The metal bob is now immersed in a liquid having density one-teeth that of the

metal of the bob. The liquid is non-viscuous. Now the period of the same pendulum with its bob remaining all the time in the liquid will be

A. $\frac{9}{10}T$

B. $T\sqrt{\frac{10}{9}}$

C. unchanged

D. $T\sqrt{\frac{9}{10}}$

Answer: B

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2. If earth is supposed to be a sphere of radius R , if g_{30} is value of acceleration due to gravity at latitude of 30° and g at the equator, the value of $g - g_{30^\circ}$ is

A. $\frac{1}{4}\omega^2 R$

B. $\frac{3}{4}\omega^2 R$

C. $\omega^2 R$

D. $\frac{1}{2}\omega^2 R$

Answer: B

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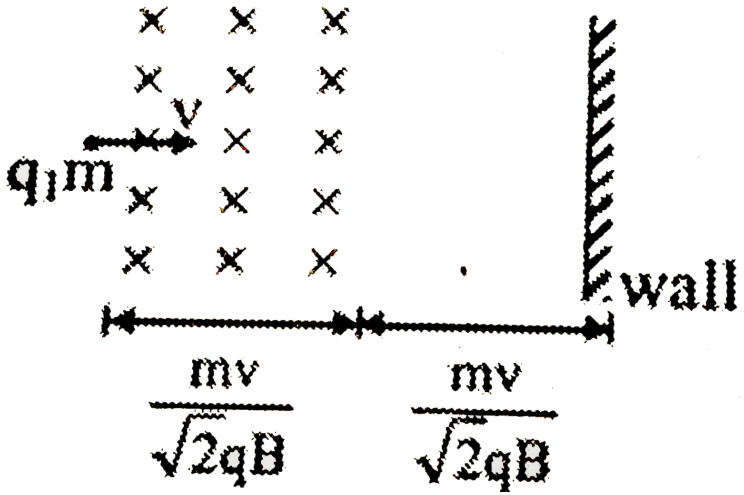
3. A particle of mass m and charge q enters a region of magnetic field (as shown) with speed v at t = 0. There is a region in which the magnetic field is absent as shown. The particle after entering the region collide elastically with a rigid wall. Time t after which the velocity of particle become antiparallel to its

initial velocity is -



A. $\frac{m(\pi+4)}{2qB}$

B. $\frac{m}{4qB}(\pi+2)$

C. $\frac{m}{qB}(\pi+2)$

D. $\frac{m}{4qB}(2\pi+3)$

Answer: A

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4. A magnet is suspended horizontal in the earth's magnetic field. When it is displaced and then released it oscillates in a horizontal plane with a period T. If a place of wood of the same moment of inertia (about the axis of rotation) as the magnet is attached to the magnet what would the new period of oscillation of the system become?

A. $\frac{T}{3}$

B. $\frac{T}{2}$

C. $\frac{T}{\sqrt{2}}$

D. $\sqrt{2}T$

Answer: D

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5. Two identical conducing ring A and B of radius R are in pure rolling over a horizontal conducing plane with same speed (of center of

mass) v but in opposite direction. A constant magnetic field B is present pointing inside the plane of paper. Then the potential difference between the highest points of the two rings, is:

A. Zero

B. 2BvR

C. 4BvR

D. None of these

Answer: C

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6. Two carnote engines A and B have their sources at 1000 K and 1100 K and their sinks are at 400 K and 500 K respectively. If η_A and η_B are their efficiencies,

A. $\eta_A < \eta_B$

B. $\eta_A = \eta_B$

C. $\eta_A > \eta_B$

D. Data is insufficient.

Answer: C

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7. A meter scale is balanced at its mid point if a 20N weight is balanced at 20 cm mark and a 30 N weight hanged at x cm mark. Calculate the value of x.

A. 20 cm

B. 70 cm

C. 30 cm

D. 80 cm

Answer: B

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8. In a semiconducting material the mobilities of electrons and holes are μ_e and μ_h respectively. Which of the following is true?

A. $\mu_h > \mu_e$

B. $\mu_e > \mu_h$

C. $\mu_e = \mu_h$

D. None of these

Answer: B

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9. What maximum frequency from following which can be reflected from ionosphere -

A. 5 MHz

B. 6GHz

C. 5KHz

D. 500 MHz

Answer: A

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10. Two waves are given by $y_1 = a\sin(\omega t - kx)$ and $y_2 = a\cos(\omega t - kx)$

. The phase difference between the two waves is -

A. $\pi/4$

B. π

C. $\pi/8$

D. $\pi/2$

Answer: D

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11. An observer moves towards a stationary source of sound of frequency n . The apparent frequency heard by him is 2 n . If the velocity of sound in air is 332 m/sec, then the velocity of the observer is

A. 166 m/sec

B. 664 m/sec

C. 332 m/sec

D. 1328 m/sec

Answer: C

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12. 10 g of ice at $0^{\circ}C$ is mixed with 100 g of water at $50^{\circ}C$. What is the resultant temperature of mixture

A. 31.2° C

B. 32.8° C

C. 36.7° C

D. 38.2° C

Answer: D

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13. At the same temperature and pressure and volume of two gases, which of the following quantities is constant -

A. Total number of molecules

B. Average kinetic energy

C. Root mean square velocity

D. Mean free path

Answer: A

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14. A $\pi - meason$ hydrogen atom is a bound state of negative charged pion (denoted by $\pi^-, m_\pi = 273m_e$) and a proton. Estimate the number of revolutions a $\pi - meason$ makes (averagely) in the ground state on the atom before , it decays (mean life of a $\pi - meason \cong 10^{-8}s$, mass of proton $= 1.67 \times 10^{-27}kg$).

A. 2×10^7

B. 2×10^{10}

C. 2×10^{14}

D. None

Answer: B

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15. M_x and M_y denote the atomic masses of the parent and the daughter nuclei respectively in a radioactive decay. The Q - value for a $\beta -$ decay is Q_1 and that for a β^+

decay is Q_2. If m_e denotes the mass of an electrons, then which of the following statements is correct?

A. $Q_1 = (M_X - M_Y)c^2 \quad \&$

$Q_2 = (M_X - M_Y - 2m_e)c^2$

B. $Q_1 = (M_X - M_Y)c^2 \quad \&$

$Q_2 = (M_X - M_Y)c^2$

C. $Q_1 = (M_X - M_Y - 2m_e)c^2 \quad \&$

$Q_2 = (M_X - M_Y + 2m_e)c^2$

D. $Q_1 = (M_X - M_Y + 2m_e)c^2$ &

$$Q_2 = (M_X - M_Y + 2m_e)c^2$$

Answer: A

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16. If an em wave of wavelength λ is incident on a photosensitive surface of negligible work function. If the photoelectrons emitted from this surface have the de-Broglie wavelength λ_1

, prove that

$$\lambda = \left(\frac{2mc}{h}\right)\lambda_1^2$$

A. $\sqrt{\left(\frac{2mc}{h}\right)}\lambda_1$

B. $\sqrt{\frac{h}{2mc}} \times \lambda_1$

C. $\left(\frac{2mc}{h}\right) \times \lambda_{\frac{2}{1}}$

D. None

Answer: C

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17. A particle A with a mass m_A is moving with a velocity v and hits a particle B (mass m_B) at rest (one dimensional motion). Find the change in the de-Broglie wavelength of the particle A. Treat the collision as elastic.

A. $\frac{h}{m_A v}\left[\left|\frac{m_A + m_B}{m_A - m_B}\right| - 1\right]$

B. $\frac{h}{m_B v}\left[\left|\frac{m_A + m_B}{m_A - m_B}\right| - 1\right]$

C. $\frac{h}{m_A v}\left[\left|\frac{m_A - m_B}{m_A + m_B}\right| - 1\right]$

D. $\frac{h}{m_B v}\left[\left|\frac{m_A - m_B}{m_A + m_B}\right| - 1\right]$

Answer: A

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18. a point charge q is situated at a distance r from one end of a thin conduction rod of length L having a charge Q (uniformly distributed a long its length).find the magnitudes of electric force between the two.

A. $\frac{1}{4\pi \in_0} \frac{qQ}{d(d+L)}$

B. $\frac{qQ}{4\pi \in_0 d}$

C. $\frac{qQ}{2\pi \in_0 d}$

D. $\frac{qQ}{8\pi \in_0 d(d+L)}$

Answer: A

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19. When a 100 W, 240 V bulb is operated at 200 volt, the current in it is -

A. 0.35 A

B. 0.42 A

C. 0.50 A

D. 0.58 A

Answer: A

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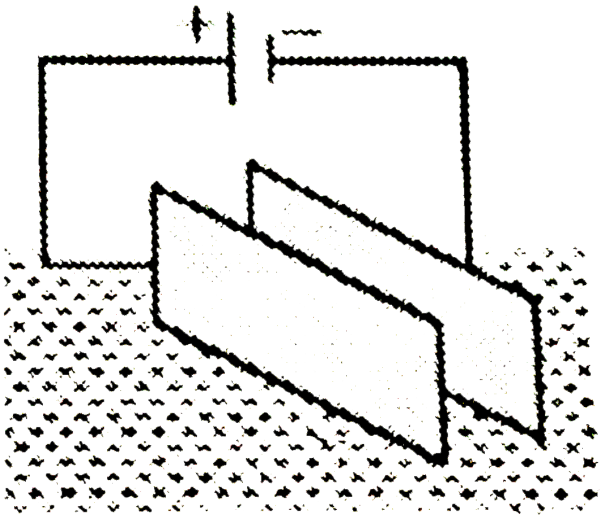
20. Two square metallic plates of side a =1 m are kept at d = 8.85 mm apart, like a parallel plate capacitor, in such a way that their surfaces are normal to the oil surface are normal to the oil surface in a tank filled with insulating oil (K = 11). The plates are connected

to a battery of emf V = 500 volt as shown in figure. The plates are then lowered vertically into the oil at a speed of v = $10^{-3} ms^{-1}$. Negalecting resistance of connecting wires, calculate the current drawn from battery during the process ($\varepsilon_0 = 8.85 \times 10^{-12} C^2 N^{-1} m^{-2}$)



A. 5×10^{-19}A

B. 0.5×10^{-19}A

C. 5×10^{-9}A

D. None of these

Answer: C

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21. A 4 m long wire of resistance 8Ω is connected in series with a battery of emf 2V and a resistor of 7Ω. The internal resistance of

the battery is 1Ω. What is the potential gradient along the wire ?

A. $0.25 V m^{-1}$

B. $0.50 V m^{-1}$

C. $0.75 V m^{-1}$

D. $1.00 V m^{-1}$

Answer: A

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22. A body of mass 5×10^{-3} kg is launched upon a rough inclined plane making an angle of 30° with the horizontal. Obtain the coefficient of friction between the body and the plane if the time of ascent is half of the time of descent.

A. 0.56

B. 0.60

C. 0.75

D. 0.364

Answer: A

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23. A body of mass m, having momentum p, is moving on a rough horizontal surface. If it is stopped in a distance x, the coefficient of friction between the body and the surface is given by

A. $\mu = \frac{p^2}{2gm^2x}$

B. $\mu = \frac{p^2}{2mgx}$

C. $\mu = \frac{p}{2mgx}$

D. $\mu = \frac{p}{2gm^2x}$

Answer: A

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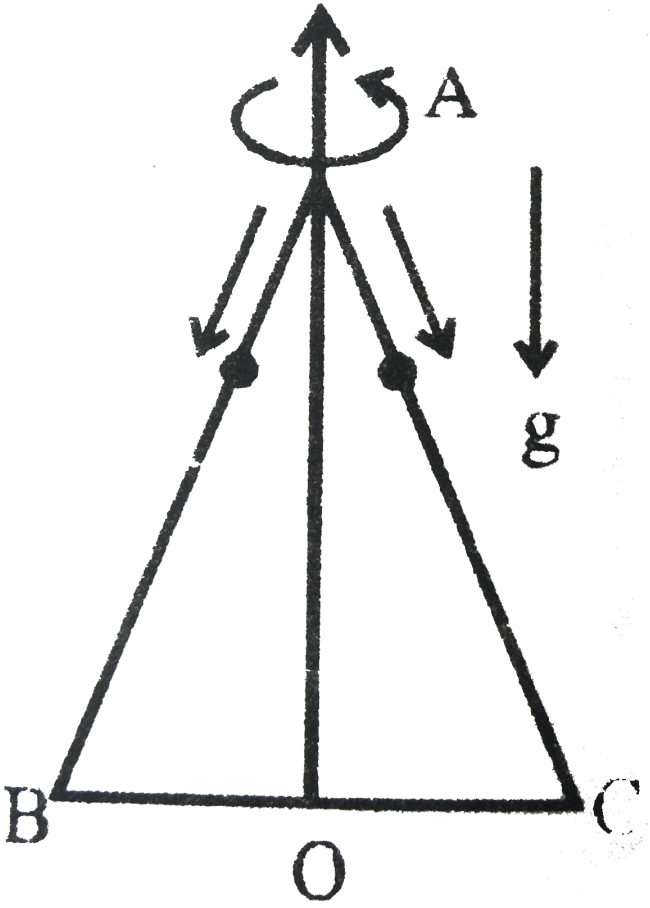
24. A equilaterial triangle ABC formed from a uniform wire has two small identical beads initially located at A. The triangle is set rotating about the vertical axis AO. Then the beads are released from rest simultaneously

and allowed to slide down. one long. AB and the other along AC as shown. Neglecting frictional effects, the quantities that are conserved as the beads slide down, are.



A. angular velocity and total energy

B. angular velocity and moment of inertia about axis of rotation

C. total angular momentum and moment of inertia about axis of rotation

D. total angular momentum and total energy

Answer: D

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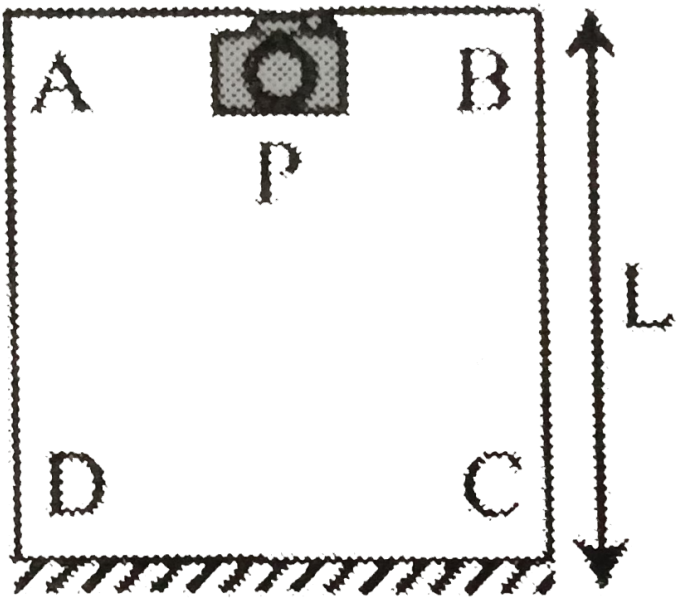
25. Adjoining figure shows cubical room ABCD, with the wall CD as a plane mirror. Each side of the room is L metres in length. A camera P is placed at the mid-point of the wall AB. At what distance should the camera be focused to photograph and object placed at A ?



A. $\frac{L}{2}$

B. L

C. 2L

D. More than 2L

Answer: D

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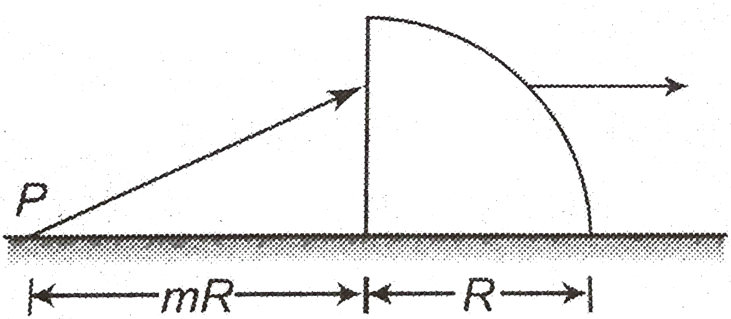

26.

A quarter cylinder of radius R and refractive index 1.5 is placed on a table.A point object P is kept at a distance of mR from it. Find the value of m for whicha ray from P will emerge parallel to the table as shown in the figure.

A. $3/2$

B. $4/3$

C. $5/4$

D. None of these

Answer: B

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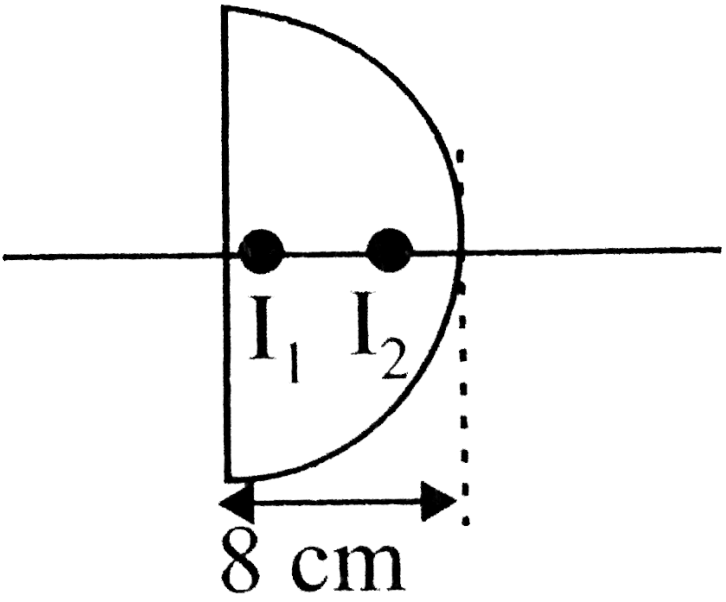
27. A plastic hemisphere has a radius of curvature of $8cm$ and an index of refraction of 1.6 . On the axis halfway between the plane surface and the spherical one $(4cm$ from each $)$ is a small object O.

The distance between the two images when viewed along the axis from the two sides of the hemisphere is approximately .



A. 1.0 cm

B. 1.5 cm

C. 3.75 cm

D. 2.5 cm

Answer: D

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28. Two particles A and B are initially $40m$ apart, A is behind B. Particle A is moving with uniform velocity of $10ms^{-1}$ towards B. Particle B starts moving away from A with constant acceleration of $2ms^{-1}$.

The time for which there is a minimum distance between the two is .

A. 2 s

B. 4 s

C. 5 s

D. 6 s

Answer: C

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29. A cannon ball has a range R on a horizontal plane. If h and h' are the greatest heights in the two paths for which this is possible, then-

A. $R = 4\sqrt{hh'}$

B. $R = \frac{4h}{h'}$

C. $R = 4hh'$

D. $R = \sqrt{hh'}$

Answer: A

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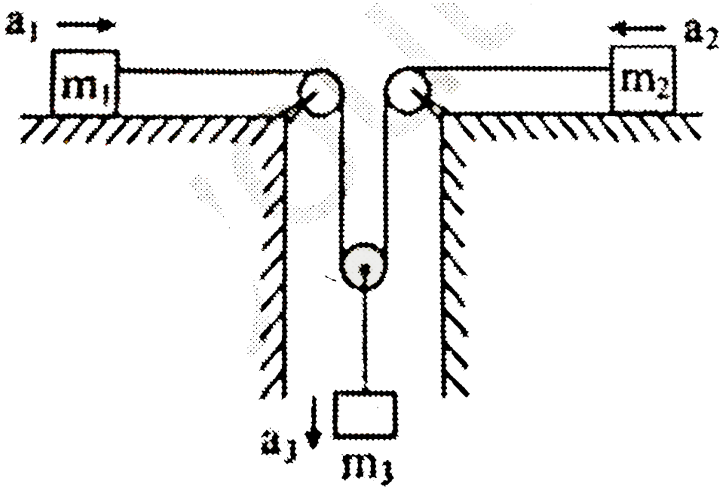
30. In the figure shown the relation between acceleration is -



A. $a_1 + a_2 + 2a_3 = 0$

B. $a_1 + a_2 = 2a_3$

C. $a_1 + a_2 = a_3$

D. $a_1 + a_2 + a_3 = 0$

Answer: B

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Part B Chemistry

1. Sodium thiosulphate, $Na_2S_2O_3.5H_2O$ is used in photography to

A. Reduce AgBr to metallic Ag

B. Remove reduced Ag

C. Remove undecomposed AgBr as a soluble complex

D. Convert metallic Ag to silver salt

Answer: C

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2. The cyanide ion CN and N_2 are isoelectronic, but in contrast to CN^-, N_2 is chemically inert, because of

A. Low bond energy

B. Absence of bond polarity

C. Unsymmetrical electron distribution

D. Presence of more number of electrons in bonding orbital

Answer: B

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3. Ferric ion forms a prussian blue coloured solution with $K_4\left[Fe(CN)_6\right]$ due to the formation of -

A. $K_3Fe(CN)_6$

B. $Fe_4\left[Fe(CN)_6\right]_3$

C. $Fe(OH)_3$

D. $KFe\left[Fe(CN)_6\right]$

Answer: B

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4. Under what conditoin of temperature and pressur the formation of atomic hydrogen from molecular hydrogen will be favoured most ?

A. High temperatured and high pressure

B. Low temperature and low pressure

C. High temperature and low pressure

D. Low temperature and high pressure

Answer: C

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5. The reaction of (S)-2 bromobutane with OH^- to produce (R)-butane-2-ol will be -

A. first order in 2-bromobutane only

B. first order in OH^- only

C. first order in 2-bromobutane and first order in OH^-

D. second order in OH^-

Answer: C

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6. 4 mole of a mixture of Mohr's salt and $Fe_2(SO_4)_3$ requires 500mL of $1M K_2Cr_2O_7$ for complete oxidation in acidic medium. The mole % of the Mohr's salt in the mixture is:

A. 25

B. 50

C. 60

D. 75

Answer: D

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7. Total charge required for the oxidation of two moles Mn_3O_4 into MnO_4^{2-} in presence of alkaline medium is

A. 5 F

B. 10 F

C. 20 F

D. None of these

Answer: C

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8. Calculate standard free energy change for the reaction $2Ag + 2H^+ \rightarrow H_2 + 2Ag^+$

Given : $E^\circ_{Ag^+ / Ag} = +0.80V$

A. 308.08 kJ

B. 154.4 kJ

C. 77.2 kJ

D. -154.4 kJ

Answer: B

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9. Which one of the following ionic species will impart colour to an aqueous solution ?

A. Ti^{+4}

B. Cu^{+}

C. Zn^{+2}

D. Cr^{+3}

Answer: D

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10. Select incorrect order :

A. $H_2O > H_2S > H_2Se > H_2Te$ (Order of bond angle)

B. $HF > HCl > HBr > Hl$ (Order of boiling point)

C. $LiCl < BeCl_2 < BCl_3 < CCl_4$ (Order of covalent character)

D. $CaF_2 > CaCl_2 > CaBr_2 < CaI_2$ (Order of melting point)

Answer: B

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11. In which of the following processes energy is absorbed ?

A. $Cl_{(g)} + e^- \rightarrow Cl^-_{(g)}$

B. $F^-_{(g)} + e^- \rightarrow F^{-2}_{(g)}$

C. $Na^+_{(g)} + e^- \rightarrow Na_{(g)}$

D. $Mg^{+2}_{(g)} + e^- \rightarrow Mg^+_{(g)}$

Answer: B

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12. An element (atomic mass $= 100g/mol$) having bcc structure has unit cell edge 400 pm .Them density of the element is

A. 2.144 g/cm^3

B. 5.188 g/cm^3

C. 7.289 g/cm^3

D. 10.376 g/cm^3

Answer: B

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13. Select the correct statement -

A. Longmuir adsoption is highly specific

B. van der wall's adsorption is reversible

C. Both (1) and (2) are exothermic

D. All are correct

Answer: D

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14. Element X crystallizes in 12 co - ordination fcc lattice. On applyng high temperature it changes to bcc lattice. Find the ratio of the

density of the crystal lattice before and and after applying high temperature

A. $1:1$

B. $3:2$

C. $\sqrt{2}:\sqrt{3}$

D. $2\left(\sqrt{2}\right)^3:\left(\sqrt{3}\right)^3$

Answer: D

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15. Which of the following is correct option for the free expansion of an ideal gas under adiabatic condition ?

A. q=0, $\Delta T < 0, w \neq 0$

B. q=0, $\Delta T \neq 0, w = 0$

C. $q \neq 0, \Delta T = 0, w = 0$

D. $q = 0, \Delta T = 0, w = 0$

Answer: D

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16. Which of the following is correct ?

A. ΔH is positive for exothermic reaction

B. ΔH is negative for endothermic reaction

C. The enthalpy of fusion in negative

D. The heat of neutralisation of strong acid with strong base is always the same

Answer: D

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17. On increasing the temperature , the rate of a reaction:

A. always increases

B. always decreases

C. first increases and then decreases

D. may increase or decreas depending upon the nature of the reaction

Answer: A

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18. The molality of 15 % by wt solution of H_2SO_4 is

A. 1.8

B. 2.2

C. 1.2

D. 2.8

Answer: A

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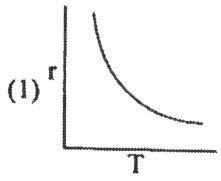
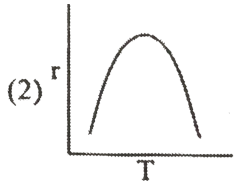
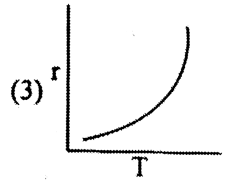
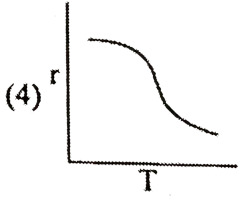
19. Rate of reaction (r) is plotted against temperature (T) for an enzyme catalysed reaction. What of the following is correct representation ?

A. 

B. 

C. 

D. 

Answer: B

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20. What volume of 75% alcohol by weight $(d - 0.80g/cm^3)$ must be used to prepare 150 cm^3 of 30 % alcohal by mass $(d = 0.90g/cm^3)$?

A. 44.44 mL

B. 56.25 mL

C. 67.5 mL

D. 33.56 mL

Answer: C

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21. The pH of blood stream is maintained by a proper balance of H_2CO_3 and $NaHCO_3$ concentration. What volume of 5 M $NaHCO_3$ solution should be mixed with a 10 mL sample

of blood which is 2 M in H_2CO_3 in order to maintain its pH ?

$[pk_a \text{ for } H_2CO_3 = 6.1][10^{1.3} = 19.9]$

A. 40 mL

B. 38 mL

C. 50 mL

D. 79 mL

Answer: D

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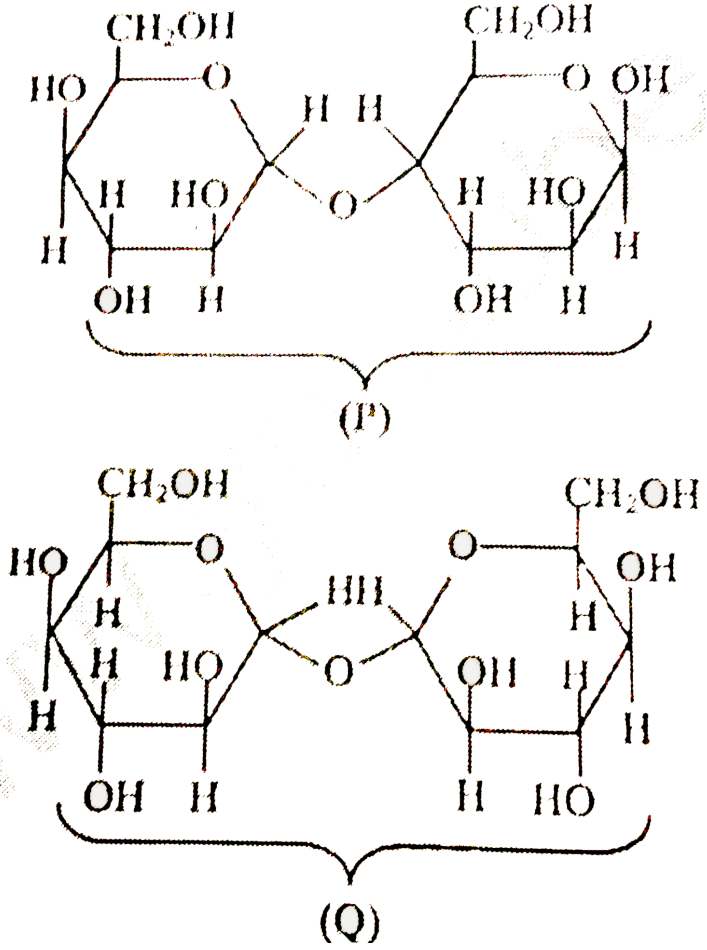
22. Which of the following disaccharide will not reduce Tollen's reagent ?



A. P

B. Q

C. P and Q both

D. None of these

Answer: B

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23. Lassaigne's test for the detection of nitrogen fails in

A. $NH_2CONHNH_2.HCl$

B. $NH_2NH_2.HCl$

C. NH_2CONH_2

D. $C_6H_5NHNH_2.HCl$

Answer: B

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24. The species which acts as electrophile in the bromination of benzene is :

A. Br_2

B. Br^-

C. Br^+

D. Br^*

Answer: C

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25.

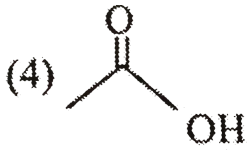
$$CH_3 - \overset{\overset{O}{||}}{C} - OH \xrightarrow[\Delta]{ND_3} (A) \xrightarrow[KOH]{Br_2} (B)$$

Product (B) is -

A. $CH_3 - ND_2$

B. $CH_3 - NH_2$

C. 

D. 

Answer: B

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26.

$$PhMgBr + (X) \xrightarrow[(2)\,H^{\oplus}]{} Ph - \overset{\overset{OH}{|}}{\underset{\underset{Ph}{|}}{C}} - Ph, (x)$$

is -

A. $Ph - \overset{\overset{O}{||}}{C} - H$

B. $Ph - \overset{\overset{O}{||}}{C} - Ph$

C. $Ph - \underset{\underset{Ph}{|}}{CH} - \overset{\overset{O}{||}}{C} - H$

D. $Ph - \overset{\overset{O}{||}}{C} - CH_3$

Answer: B

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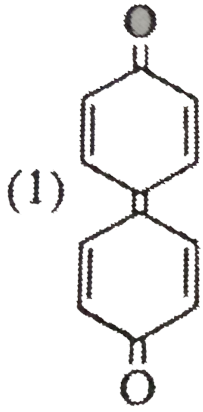
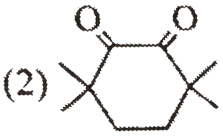
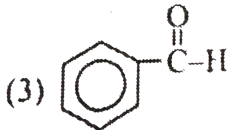
27. Which of the following compound will undergo tautomerism?

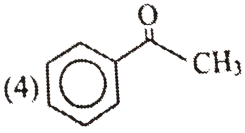
A.



B.



C. 

D. 

Answer: C

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28. Which metal does not form nitrate when heated with conc. HNO_3 ?

A. Zn

B. Mg

C. Sn

D. Pb

Answer: C

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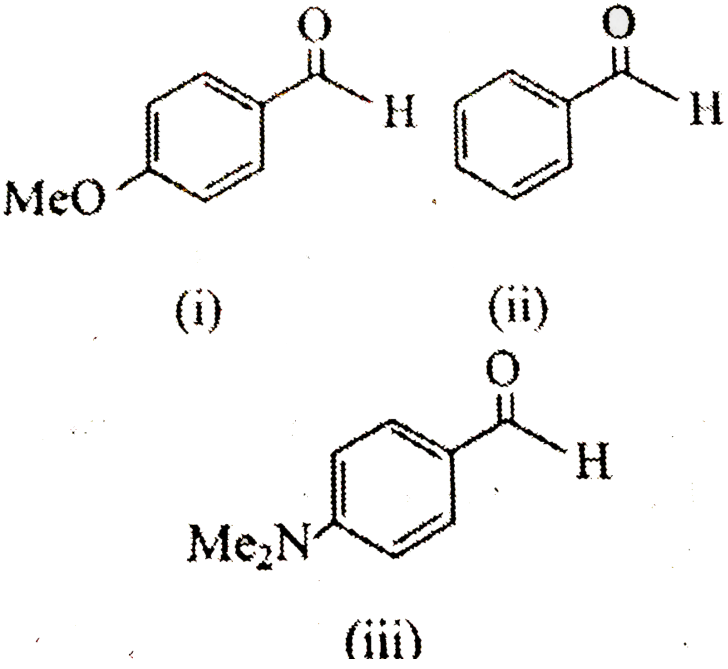
29. The K_{eq} values in HCN addition to following aldehydes are in the order -



A. igtiigtiii

B. iigtiiigti

C. iiigtigtii

D. iigtigtiii

Answer: D

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