SERIES - 43

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Questions & Answers for DUMET-2009
(Delhi University Medical/Dental Entrance Test)

by Aakash Institute

[PHYSICS]

1. A raindrop with radius 1.5 mm falls from a cloud at a height 1200 m from ground. The density of water is 1000 kg/m^3 and density of water is 1.2 kg/m^3 **(It should have been air instead of water)**. Assume the drop was spherical throughout the fall and there is no air drag. The impact speed of the drop will be :

(1) 27 km/h (2) 550 km/h

(3) Zero (4) 129 km/h

Answer (2)

Hints :

$$g' = g\left(1-\frac{d}{\rho}\right) \approx g$$

$$u = \sqrt{2gh} = \sqrt{2\times 10\times 1200}\ \text{m/s}$$

In km/hr nearly 550 km/h

2. A man is standing on an international space station, which is orbiting earth at an altitude 520 km with a constant speed 7.6 km/s. If the man's weight is 50 kg, his acceleration is

(1) 7.6 km/s^2 (2) 7.6 m/s^2

(3) 8.4 m/s^2 (4) 10 m/s^2

Answer (3)

Hints :

$$g' = g\frac{R^2}{(R+h)^2} \quad \text{or} \quad a = \frac{v^2}{r}$$

3. A rope of mass 0.1 kg is connected at the same height of two opposite walls. It is allowed to hang under its own weight. At the contact point between the rope and the wall, the rope makes an angle θ = 10º with respect to horizontal. The tension in the rope at its midpoint between the walls is

(1) 2.78 N (2) 2.56 N

(3) 2.82 N (4) 2.71 N

Answer (3)

Hints :

$2T\sin\theta = mg$

Tension at midpoint

$T' = T\cos\theta$

$$= \frac{mg}{2\tan\theta}$$

$$\approx \frac{mg}{2\theta}$$

4. A boat crosses a river from port *A* to port *B*, which are just on the opposite side. The speed of the water is V_W and that of boat is V_B relative to water. Assume $V_B = 2\ V_W$. What is the time taken by the boat, if it has to cross the river directly on the AB line?

(1) $\frac{2D}{V_B\sqrt{3}}$ (2) $\frac{\sqrt{3}D}{2V_B}$

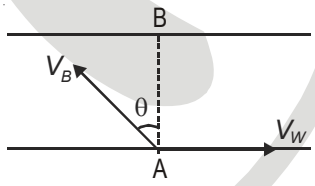
(3) $\frac{D}{V_B\sqrt{2}}$ (4) $\frac{D\sqrt{2}}{V_B}$

Answer (1)

Hints :

To move straight on *AB*

$V_B\sin\theta = V_W$



$$\sin\theta = \frac{1}{2}$$

$$\cos\theta = \frac{\sqrt{3}}{2}$$

Time to cross the river is = $\frac{D}{V_B\cos\theta}$

$$= \frac{2D}{V_B\sqrt{3}}$$

[Width of river (D) is not mentioned in the question]

5. Raindrops are falling from a certain height. Assume all raindrops are spherical and have same drag coefficient. The impact speed of large raindrops compared to that of small raindrops is

(1) Greater (2) Smaller

(3) Same (4) Depends on height

Answer (1)

6. Top of the stratosphere has an electric field E (in units of V/m) nearly equal to

(1) 0 (2) 10

(3) 100 (4) 1000

Answer (3)

7. The surface charge density (in C/m^2) of the earth is about

(1) 10^{-9} (2) -10^{9}

(3) 10^{9} (4) -10^{-9}

Answer (4)

8. Gauss's law is valid for

(1) Any closed surface (2) Only regular closed surfaces

(3) Any open surfaces (4) Only irregular open surfaces

Answer (1)

9. One of the following is **not** a property of field lines

(1) Field lines are continuous curves without any breaks

(2) Two field lines cannot cross each other

(3) Field lines start at positive charges and end at negative charges

(4) They form closed loops

Answer (4)

10. Nichrome or Manganin is widely used in wire bound standard resistors because of their

(1) Temperature independent resistivity

(2) Very weakly temperature dependent resistivity

(3) Strong dependence of resistivity with temperature

(4) Mechanical strength

Answer (2)

11. A galvanometer coil has a resistance of 10 Ω and the meter shows full scale deflection for a current of 1mA. The shunt resistance required to convert the galvanometer into an ammeter of range 0-100mA is about

(1) 10 Ω (2) 1 Ω

(3) 0.1 Ω (4) 0.01 Ω

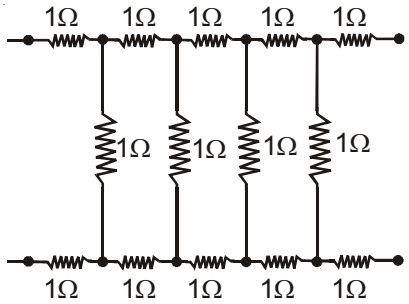
Answer (3)

Hints :

$S(I - I_g) = GI_g$

$$S = \frac{GI_9}{(I - I_9)} = 10 \times \frac{1}{99} \approx 0.1\Omega$$

12. The current (in amperes drawn from a 12 V supply by the infinite network shown in the following figure is

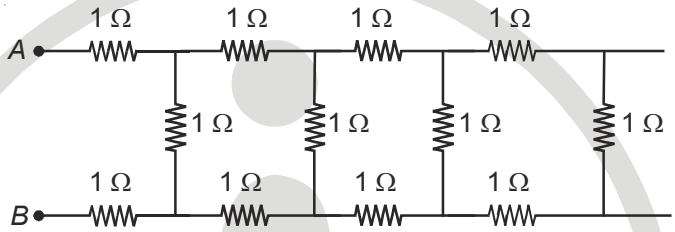


(1) 2.7 (2) 3.3

(3) 4.4 (4) 5.2

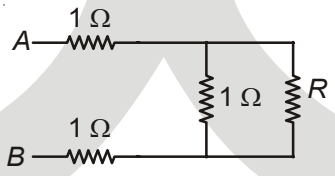
Answer (3)

Hints :



Let the equivalent resistance between A and B is R. If one of the step is removed the equivalent resistance will remain same.

So, $\frac{R}{R+1}+2=R$



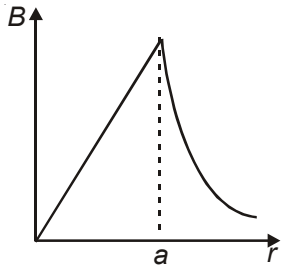
$\Rightarrow \quad R = (1+\sqrt{3})$

Current = $I=\frac{V}{R}=\frac{(12)}{(1+\sqrt{3})}$

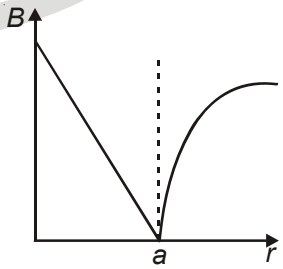
= 4.4*A*

13. A long straight wire of a circular cross-section (radius *a*) carries a steady current *I* and the current *I* is uniformly distributed across this cross-section. Which of the following plots represents the variation of magnitude of magnetic field *B* with distance *r* from the centre of the wire?

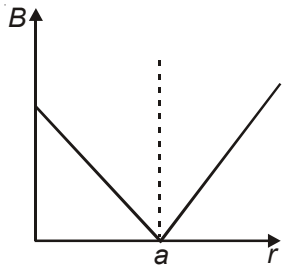
(1)



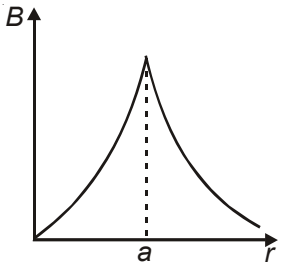
(2)



(3)



(4)



Answer (1)

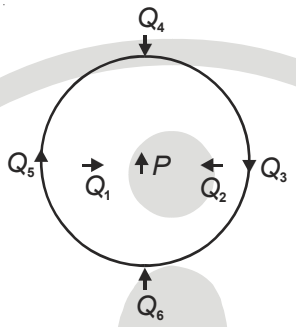
14. The gyromagnetic ratio of an electron of charge *e* and mass *m* is equal to

(1) $\frac{e^2}{2m}$ (2) $\frac{e}{2m^2}$

(3) $\frac{e}{4m}$ (4) $\frac{e}{2m}$

Answer (4)

15. The figure below shows the various positions (labelled by subscripts) of small magnetized needles P and Q. The arrows show the direction of their magnetic moment. Which configuration corresponds to the lowest potential energy among all the configurations shown?



(1) PQ_3 (2) PQ_4

(3) PQ_5 (4) PQ_6

Answer (4)

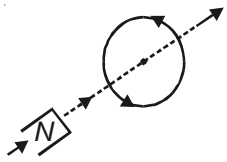
Hints :

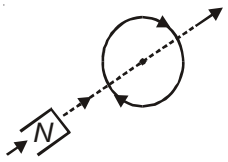
For Q_3 and Q_6 angle between *M* and *B* is 0°

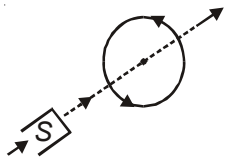
so $U = -MB$

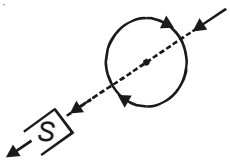
for Q_6, Magnetic induction will be more, so U will be less

16. Which of the following figures correctly depicts the Lenz's law? The arrows show the movement of the labelled pole of a bar magnet into a closed circular loop and the arrows on the circle show the direction of the induced current.

(1) 

(2) 

(3) 

(4) 

Answer (1)

17. An a.c. voltage is applied to a pure inductor *L*, drives a current in the inductor. The current in the inductor would be

(1) Ahead of the voltage by $\frac{\pi}{2}$ (2) Lagging the voltage by $\frac{\pi}{2}$

(3) Ahead of the voltage by $\frac{\pi}{4}$ (4) Lagging the voltage by $\frac{3\pi}{4}$

Answer (2)

18. The radiation pressure (in N/m^2) of the visible light is of the order of

(1) 10^{-2} (2) 10^{-4}

(3) 10^{-6} (4) 10^{-8}

Answer (3)

19. The critical angle for total internal reflection in diamond is 24.5°. The refractive index of the diamond is

(1) 2.41 (2) 1.41

(3) 2.59 (4) 1.59

Answer (1)

Hints :

$$i_C = \sin^{-1}\left(\frac{1}{\mu}\right)$$

20. When a glass lens with $n = 1.47$ is immersed in a trough of liquid, it looks to be disappeared. The liquid in the trough could be

(1) Water (2) Kerosene

(3) Glycerin (4) Alcohol

Answer (3)

21. In Young's double slit experiment, two slits are made 5 mm apart and the screen is placed 2 m away. What is the fringe separation when light of wavelength 500 nm is used?

(1) 0.002 mm (2) 0.02 mm

(3) 0.2 mm (4) 2 mm

Answer (3)

Hints :

$\beta = \frac{\lambda D}{d}$ $\lambda = 5 \times 10^{-7}$ m

$D = 2$ m

So $\beta = 0.2 \times 10^{-3}$ m $d = 5 \times 10^{-3}$ m

22. For what distance is ray optics a good approximation when the aperture is 4 mm wide and the wavelength is 500 nm?

(1) 32 m (2) 64 m

(3) 16 m (4) 8 m

Answer (1)

Hints :

$Z_F = \frac{a^2}{\lambda}$ $a = 4 \times 10^{-3}$

$\lambda = 5 \times 10^{-7}$

$= \frac{16 \times 10^{-6}}{5 \times 10^{-7}}$

= 32 m

23. Which of the following metal thermionically emit an electron at a relatively lowest temperature among them?

(1) Platinum (2) Copper

(3) Aluminium (4) Molybdenum

Answer (3)

24. Among the following four spectral regions, the photon has the highest energy in

(1) Infrared (2) Violet

(3) Red (4) Blue

Answer (2)

25. Which of these particles (having the same kinetic energy) has the largest de Broglie wavelength?

(1) Electron (2) Alpha particle

(3) Proton (4) Neutron

Answer (1)

26. The radius of an electron orbit in a hydrogen atom is of the order of

(1) 10^{-8} m (2) 10^{-9} m

(3) 10^{-11} m (4) 10^{-13} m

Answer (3)

27. The size of nucleus of an atom of mass number A is proportional to

(1) $A^{3/4}$ (2) $A^{2/3}$

(3) $A^{1/3}$ (4) $A^{5/3}$

Answer (3)

28. A radioactive isotope has a half-life of 2 years. How long will it take the activity to reduce to 3% of its original value?

(1) 4.8 years (2) 7 years

(3) 10 years (4) 9.6 years

Answer (3)

Hints :

3% is nearly equal $\left(\frac{1}{2}\right)^5$

so it will take 5 half lives

29. A p-n photodiode is fabricated from a semiconductor with band gap of 2.8 eV. Which of the following wavelengths it can detect?

(1) 950 nm (2) 820 nm

(3) 580 nm (4) 440 nm

Answer (4)

Hints :

$\lambda = \frac{1240}{2.8}\text{nm} = 442\text{ nm}$

30. An *n-p-n* transistor having a.c. current gain of 50 is to be used to make an amplifier of power gain of 300. What will be the voltage gain of the amplifier?

(1) 8.5 (2) 6

(3) 4 (4) 3

Answer (2)

Hints :

Power gain = Voltage gain × Current gain

31. A water molecule has an electric dipole moment 6.4×10^{-30} C.m. when it is in vapour state. The distance in meter between the centre of positive and negative charge of the molecule is

(1) 4×10^{-10} (2) 4×10^{-11}

(3) 4×10^{-12} (4) 4×10^{-13}

Answer (2)

32. The radius of the rear wheel of bicycle is twice that of the front wheel. When the bicycle is moving, the angular speed of the rear wheel compared to that of the front is

(1) Greater (2) Smaller

(3) Same (4) Exact double

Answer (2)

33. A uniform rod of length L and mass 1.8 kg is made to rest on two measuring scale at its two ends. A uniform block of mass 2.7 kg is placed on the rod at a distance $\frac{L}{4}$ from the left end. The force experienced by the measuring scale on the right end is

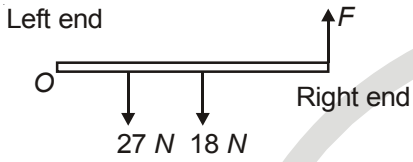
(1) 18 N (2) 27 N

(3) 29 N (4) 45 N

Answer (*)

Note: **No correct answer is provided in the choices, the correct answer is** $\frac{63}{4}$N

Hints :



Net torque about O $= \frac{27L}{4} + \frac{18L}{2} - FL = 0$

$\Rightarrow F = \frac{27}{4} + \frac{18}{2} = \frac{63}{4} \approx 15.75\text{N}$

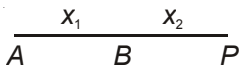
34. You drive a car at a speed of 70 km/hr in a straight road for 8.4 km, and then the car runs out of petrol. You walk for 30 min to reach a petrol pump at a distance of 2 km. The average velocity from the beginning of your drive till you reach the petrol pump is

(1) 16.8 km/h (2) 35 km/h

(3) 64 km/h (4) 18.6 km/h

Answer (1)

Hints :



For

AB $x_1 = 8.4$

$v_1 = 70$ km/h.

$t_1 = \frac{x_1}{v_1} = \frac{12}{100}$ h.

BP $x_1 = 2$ km

$t_2 = \frac{1}{2}$h

Averge velocity = $\frac{x_1 + x_2}{t_1 + t_2} = \frac{10.4}{\frac{12}{100} + \frac{1}{2}} \approx 16.77\text{km/h}$

35. Two iron blocks of equal mass but with double surface area slide down an inclined plane with friction coefficient μ. If the first block with surface area *A* experience a frictional force *f*, then the second block with surface area 2*A* will experience a frictional force

(1) $\frac{f}{2}$ (2) f

(3) $2f$ (4) $4f$

Answer (2)

36. A point mass *m* is placed inside a spherical shell of radius *R* and mass *M* at a distance $\frac{R}{2}$ from the center of the shell. The gravitational force exerted by the shell on the point mass is

(1) $\frac{GMm}{R^2}$ (2) $-\frac{GMm}{R^2}$

(3) Zero (4) $4\frac{GMm}{R^2}$

Answer (3)

37. The motion of a particle executing SHM in one dimension is described by $x = -0.5\sin\left(2t + \frac{\pi}{4}\right)$, where *x* is in meters and *t* in seconds. The frequency of oscillation in Hz is

(1) 2 (2) π

(3) $\frac{\pi}{2}$ (4) $\frac{1}{\pi}$

Answer (4)

Hints :

$f = \frac{\omega}{2\pi}$

38. Two stars of mass m_1 and m_2 are parts of a binary star system. The radii of their orbits are r_1 and r_2 respectively, measured from the C.M. of the system. The magnitude of gravitational force m_1 exerts on m_2 is

(1) $\frac{m_1 m_2 G}{(r_1 + r_2)^2}$

(2) $\frac{m_1 G}{(r_1 + r_2)^2}$

(3) $\frac{m_2 G}{(r_1 + r_2)^2}$

(4) $\frac{(m_1 + m_2)}{(r_1 + r_2)^2}$

Answer (1)

39. On the centre of frictionless table a small hole is made, through which a weightless string of length $2l$ is inserted. On the two ends of the string two balls of the same mass m are attached. Arrangement is made in such a way that half of the string is on the table top and half is hanging below. The ball on the table top is made to move in a circular path with a constant speed V. What is the centripetal acceleration of the moving ball?

(1) mVl (2) g

(3) Zero (4) $2mVl$

Answer (2)

Hints :

For ball on the table, $\frac{mv^2}{l} = T$

and for hanging ball, $T = mg$

So $\frac{v^2}{l} = g$

40. Tom and Dick are running forward with the same speed. They are throwing a rubber ball to each other at a constant speed V as seen by the thrower. According to Sam who is standing on the ground the speed of ball is

(1) Same as V (2) Greater than V

(3) Less than V (4) None of these

Answer (2)

41. A ball moves in a frictionless inclined table without slipping. The work done by the table surface on the ball is

(1) Positive (2) Negative

(3) Zero (4) None of these

Answer (3)

42. A synchronous satellite goes around the earth once in every 24 h. What is the radius of orbit of the synchronous satellite in terms of the earth's radius? (Given mass of the earth, $m_e = 5.98 \times 10^{24}$ kg, radius of the earth, $r_e = 6.37 \times 10^6$ m, Universal constant of gravitation, $G = 6.67 \times 10^{-11}$ N.m^2/kg^2)

(1) 2.4 r_e (2) 3.6 r_e

(3) 4.8 r_e (4) 6.6 r_e

Answer (4)

43. Two cylinders of equal size are filled with equal amount of ideal diatomic gas at room temperature. Both the cylinders are fitted with pistons. In cylinder A the piston is free to move, while in cylinder B the piston is fixed. When same amount of heat is supplied to both the cylinders, the temperature of the gas in cylinder A raises by 20°K. What will be the rise in temperature of the gas in cylinder B?

(1) 28°K (2) 20°K

(3) 15°K (4) 10°K

Answer (1)

Hints :

For gas in cylinder A,

$Q = nC_P \Delta T_1$

$Q = n\, C_V \Delta T_2$

So, $\Delta T_2 = \frac{C_P}{C_V} \Delta\, T_1$

$= \frac{7}{5} \times 20 = 28$ K

44. An ideal gas is made to go through a cyclic thermodynamical process in four steps. The amount of heat involved are Q_1 = 600 J, Q_2 = –400 J, Q_3 = –300 J and Q_4 = 200 J respectively. The corresponding work involved are W_1 = 300 J, W_2 = –200 J, W_3 = –150 J and W_4. What is the value of W_4?

(1) –50 J (2) 100 J

(3) 150 J (4) 50 J

Answer (3)

Hints :

$Q = \Delta U + W$ and $\Delta U = 0$

$Q = Q_1 + Q_2 + Q_3 + Q_4 = 100$

$W = W_1 + W_2 + W_3 + W_4 = -50 + W_4$

$W_4 = 150$ J

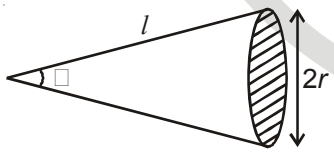
45. The angle subtended by a coin of radius 1 cm held at a distance of 80 cm from your eyes is

(1) 1.43° (2) 0.72°

(3) 0.0125° (4) 0.025°

Answer (1)

Hints :



$\theta = \frac{2r}{l}$

46. The three initial and final position of a man on the *x*-axis are given as

(i) (–8 m, 7 m)

(ii) (7 m, –3 m)

(iii) (–7 m, 3 m)

Which pair gives the negative displacement?

(1) (i) (2) (ii)

(3) (iii) (4) (i) and (iii)

Answer (2)

47. A bird flies from (–3 m, 4 m, –3 m) to (7 m, –2 m, –3 m) in *xyz* coordinates. The bird's displacement in unit vectors is given by

(1) $(4i + 2j - 6k)$ (2) $(10i + 6j)$

(3) $(4i - 2j)$ (4) $(10i + 6j - 6k)$

Answer (*)

Note: **The correct answer is (10i – 6j). There is misprint in the choice.**

Hints :

$\vec{r}_i = -3\hat{i} + 4\hat{j} - 3\hat{k}$

$\vec{r}_f = 7\hat{i} - 2\hat{j} - 3\hat{k}$

So, displacement vector $(\vec{r}_f - \vec{r}_i) = 10\hat{i} - 6\hat{j}$

48. A coastguard ship locates a pirate ship at a distance 560 m. It fires a cannon ball with an initial speed 82 m/s. At what angle from horizontal the ball must be fired so that it hits the pirate ship?

(1) 54° (2) 125°

(3) 27° (4) 18°

Answer (3)

Hints :

$$R = \frac{u^2 \sin 2\theta}{g}$$

$\Rightarrow 2\theta = 53.8$

$\Rightarrow \theta \approx 27°$

49. An object moves at a constant speed along a circular path in a horizontal *XY* plane, with the centre at the origin. When the object is at $x = -2$ m, its velocity is $-(4 \text{ m/s})\hat{j}$. What is the object's acceleration when it is $y = 2$ m?

(1) $-(8 \text{ m/s}^2)\hat{j}$ (2) $-(8 \text{ m/s}^2)\hat{i}$

(3) $(-4 \text{ m/s}^2)\hat{j}$ (4) $(4 \text{ m/s}^2)\hat{i}$

Answer (1)

Hints :

$a = \frac{u^2}{r} = 8 \text{ m/s}^2$ toward centre of the circle

50. A block is lying static on the floor. The maximum value of static frictional force on the block is 10 N. If a horizontal force of 8 N is applied to the block, what will be the frictional force on the block?

(1) 2 N (2) 18 N

(3) 8 N (4) 10 N

Answer (3)

[CHEMISTRY]

51. Chlorobenzene is ____?____ reactive than benzene towards electrophilic substitution and directs the incoming electrophile to the ____?____ position.
(1) More, ortho/para (2) Less, ortho/para
(3) More, meta (4) Less, meta

Answer (2)

52. When acetyl chloride reacts with sodium propionate, the product formed is
(1) Acetic anhydride (2) Acetic propionic anhydride
(3) *n*-propyl acetate (4) Pent-2, 4-dione

Answer (2)

53. In the reaction below, X is
$C_6H_5MgBr + CH_3OH \rightarrow X$
(1) C_6H_6 (2) C_6H_5OH
(3) $C_6H_5OCH_3$ (4) CH_3COOH

Answer (1)

54. Which of the following compounds will show geometric isomerism?
(1) Cyclohexene (2) 2-hexene
(3) 3-hexyne (4) 1, 1-diphenyl ethylene

Answer (2)

55. Which of the following reactions involves carbon-carbon bond formation?
(1) Reimer-Tiemann reaction (2) Hydroboration-oxydation
(3) Cannizzaro reaction (4) Reaction of primary alcohols with PCC

Answer (1)

56. Aldol condensation **does not** occur between
(1) Two different aldehydes (2) Two different ketones
(3) An aldehyde and a ketone (4) An aldehyde and an ester

Answer (4)

57. Which of the following statements is **not** true?
(1) Pheromones are secreted outside the body by the insects
(2) Aspirin is analgesic and anti-pyretic
(3) Sucrose is a dipeptide commonly known as aspartame
(4) The DNA assists in the synthesis of RNC molecules

Answer (3)

58. In which of the following reactions, the product obtained is chiral?
(1) $CH_3COCH_3 \xrightarrow{NaBH_4}$ (2) $CH_3COCl \xrightarrow{\text{Rosenmund reduction}}$
(3) $CH_3CH_2COCH_2CH_3 \xrightarrow{Sn, HCl}$ (4) $CH_3CH_2COCH_3 \xrightarrow{LiAlH_4}$

Answer (4)

59. Which of the following compounds gives blood red coloration when its Lassaigne's extract is treated with alkali and ferric chloride?

(1) Thiourea (2) Diphenyl sulfide

(3) Phenyl hydrazine (4) Benzamide

Answer (1)

60. Which of the following statements is **not** correct?

(1) Allergic conditions are cured by anti-histamines

(2) Hormones are continuously produced but not stored in the body

(3) The function of the white blood cells is to protect the body against infections

(4) Catabolism involves degradation of molecules

Answer (2)

61. m-Bromoaniline can be prepared by

(1) $C_6H_6 \xrightarrow[H_2SO_4]{HNO_3} \xrightarrow[2.\ NaOH,\ H_2O]{1.\ Sn\text{-}HCl} \xrightarrow[H_2O]{Br_2}$ (2) $C_6H_6 \xrightarrow[FeBr_3]{Br_2} \xrightarrow[H_2SO_4]{HNO_3} \xrightarrow[Pt]{H_2}$

(3) $m\text{-}BrC_6H_4COOH \xrightarrow{SOCl_2} \xrightarrow{NH_3} \xrightarrow[H^+]{Br_2,NaOH}$ (4) $C_6H_5NH_2 \xrightarrow[Cu_2Br_2]{NaNO_2,\ HCl} \xrightarrow{NaNH_2}$

Answer (3)

62. In the reaction below, X is

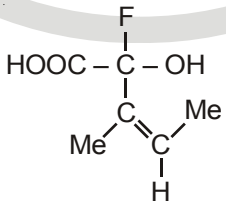
$$\text{Neopentyl alcohol} \xrightarrow{H_2SO_4} X$$

(1) 2-methylpentane (2) 2-methyl pent-2-ene

(3) 2-methyl but-2-ene (4) Neopentane

Answer (3)

63. The configuration of the chiral centre and the geometry of the double bond in the following molecule can be described by



(1) R and E (2) S and E

(3) R and Z (4) S and Z

Answer (3)

64. Which polymers occur naturally?

(1) Starch and Nylon (2) Starch and Cellulose

(3) Proteins and Nylon (4) Proteins and PVC

Answer (2)

65. Calculate the work done when I mol of an ideal gas is compressed reversibly from 1.0 bar to 4.00 bar at a constant temperature of 300 K

*(1) 4.01 kJ (2) –8.02 kJ

(3) 18.02 kJ (4) –14.01 kJ

Answer (1)

Note: **The correct answer is 3.45 kJ but the nearest approximate value can be taken as 4.01 kJ.**

66. The enthalpy of neutralization of oxalic acid by a strong base is –25.4 kcal mol^{-1}. The enthalpy of neutralization of strong acid and strong base is –13.7 kcal $equiv^{-1}$. The enthalpy of dissociation of $H_2C_2O_4 \leftrightarrow 2H^+ + C_2O_4^{2-}$ is

(1) 1.0 kcal mol^{-1} (2) 2.0 kcal mol^{-1}

(3) 18.55 kcal mol^{-1} (4) 11.7 kcal mol^{-1}

Answer (2)

67. At the equilibrium of the reaction $2X(g) + Y(g) \rightarrow X_2Y(g)$, the number of moles of X_2Y at equilibrium is affected by the

(1) Temperature and pressure (2) Temperature only

(3) Pressure only (4) Temperature, pressure and catalyst used

Answer (1)

68. For a first order reaction, the time required for 99.9% of the reaction to take place is nearly

(1) 10 times that required for half of the reaction

(2) 100 times that required for two-thirds of the reaction

(3) 10 times that required for one-fourth of the reaction

(4) 20 times that required for half of the reaction

Answer (1)

69. An endothermic reaction has a positive internal energy change ΔU. In such a case, what is the minimum value that the activation energy can have?

(1) ΔU (2) $\Delta U = \Delta H + \Delta nRT$

(3) $\Delta U = \Delta H - \Delta nRT$ (4) $\Delta U = Ea + RT$

Answer (3)

70. A compound contains two types of atoms X and Y. It crystallizes in a cubic lattice with atoms X at the corners of the unit cell and atoms Y at the body centers. The simplest possible formula of this compound is

(1) X_8Y (2) X_2Y

(3) XY (4) XY_8

Answer (3)

71. Which of the following halogens does not exhibit a positive oxidation number in their compounds?

(1) I (2) Br

(3) Cl (4) F

Answer (4)

72. Among the following, the strongest conjugate base is

(1) NO_3^- (2) Cl^-

(3) SO_4^{2-} (4) CH_3COO^-

Answer (4)

73. Determine the pH of the solution that results from the addition of 20.00 mL of 0.01 M $Ca(OH)_2$ to 30.00 mL of 0.01 M HCl

(1) 11.30 (2) 10.53

(3) 2.70 (4) 8.35

Answer (1)

74. Adsorption is an exothermic process. The amount of substance absorbed should

(1) Increase with decrease in temperature (2) Increase with increase in temperature

(3) Decrease with decrease in temperature (4) Decrease with increase in temperature

Answer (4)

75. Fog is a colloidal solution of

(1) Liquid particles dispersed in gas (2) Gaseous particles dispersed in a liquid

(3) Solid particles dispersed in a liquid (4) Solid particles dispersed in gas

Answer (1)

76. The correct set of quantum numbers for the unpaired electron of a chlorine atom is

(1) 2, 0, 0, +1/2 (2) 2, 1, –1, +1/2

(3) 3, 1, –1, ±1/2 (4) 3, 0, 0, ±1/2

Answer (3)

77. The temperature at which real gases obey the ideal gas laws over a wide range of pressures is called

(1) Critical temperature (2) Inversion temperature

(3) Boyle temperature (4) Reduced temperature

Answer (3)

78. Common salt obtained from sea-water contains 95% NaCl by mass. The approximate number of molecules present in 10.0 g of the salt is

(1) 10^{21} (2) 10^{22}

(3) 10^{23} (4) 10^{24}

Answer (3)

79. In the redox reaction

$xKMnO_4 + yNH_3 \rightarrow KNO_3 + MnO_2 + KOH + H_2O$

(1) x = 4, y = 6 (2) x = 3, y = 8

(3) x = 8, y = 6 (4) x = 8, y = 3

Answer (4)

80. Which of the following aqueous solutions has the highest boiling point?

(1) 0.1 M KNO_3 (2) 0.1 M Na_3PO_4

(3) 0.1 M $BaCl_2$ (4) 0.1 M K_2SO_4

Answer (2)

81. The values of electronegativity of atoms A and B are 1.2 and 4.0 respectively. The % ionic character of the A – B bond is

(1) 50% (2) 72.24%

(3) 55.3% (4) 43%

Answer (2)

82. 100 ml of PH_3 on heating forms P and H_2, the volume change in the reaction is

(1) An increase of 50 ml (2) An increase of 100 ml

(3) An increase of 150 ml (4) A decrease of 50 ml

Answer (1)

83. The common features among the species CN^-, CO and NO^+ are

(1) Bond order three and iso-electronic (2) Bond order three and weak-field ligands

(3) Bond order two and π-acceptor (4) Iso-electronic and weak-field ligands

Answer (1)

84. The magnitude of crystal field stabilization energy (CFSE or Δ_t) in tetrahedral complexes is considerably less than in the octahedral field. Because

(1) There are only four ligands instead of six so the ligand field is only 2/3 the size hence the Δ_t is only 2/3 the size

(2) The direction of the orbitals does not coincide with the direction of the ligands. This reduces the crystal field stabilization energy (Δ_t) by further 2/3

(3) Both points (1) & (2) are correct

(4) Both points (1) & (2) are wrong

Answer (3)

85. The role of phosphate in detergent powder is to

(1) Control pH level of the detergent water mixture

(2) Remove Ca^{2+} and mg^{2+} ions from the water that causes the hardness of water

(3) Provide whiteness to the fabrics

(4) Form solid detergent as phosphate-less detergents are liquid in nature

Answer (2)

86. If I_2 is dissolved in aqueous KI, the intense yellow species, I_3^-, is formed. The structure of I_3^- ion is

(1) Square pyramidal (2) Trigonal bipyramidal

(3) Octahedral (4) Pentagonal bipyramidal

Answer (2)

87. In the change of NO^+ to NO, the electron is added to the

(1) σ orbital (2) π orbital

(3) σ^* orbital (4) π^* orbital

Answer (4)

88. Iron has an oxidation number of +3, in which of the following compounds?

(1) $Fe(NO_3)_2$ (2) FeC_2O_4

(3) $[Fe(H_2O)_6]Cl_3$ (4) $(NH_4)_2\ SO_4.FeSO_4.6H_2O$

Answer (3)

89. The expected spin-only magnetic moments for $[Fe(CN_6)]^{4-}$ and $[FeF_6]^{3-}$ are

(1) 1.73 and 1.73 B.M. (2) 1.73 and 5.92 B.M.

(3) 0.0 and 1.73 B.M. (4) 0.0 and 5.92 B.M.

Answer (4)

90. The crystal field stabilization energy (CFSE) is the highest for

(1) $[CoF_4]^{2-}$ (2) $[Co(NCS)_4]^{2-}$

(3) $[Co(NH_3)_6]^{3+}$ (4) $[CoCl_4]^{2-}$

Answer (3)

91. Which of the following reactions will *not* give the anhydrous $AlCl_3$?

(1) By heating $AlCl_3.6H_2O$

(2) By passing dry HCl gas on heated aluminium powder

(3) By passing dry chlorine gas on heated aluminium powder

(4) By passing dry chlorine gas over a heated mixture of alumina and coke

Answer (1)

92. A metallic ion M^{2+} ion has an electronic configuration of 2, 8, 14 and the ionic weight is 56 amu. The numbers of neutrons in its nucleus are :

(1) 30 (2) 32

(3) 34 (4) 42

Answer (1)

93. Which of the following has the highest value of radioactivity?

(1) 1 gm of Ra (2) 1 gm of $RaSO_4$

(3) 1 gm of $RaBr_2$ (4) 1 gm of $Ra(HPO_4)$

Answer (1)

94. It is believed that atoms combine with each other such that the outermost shell acquires a stable configuration of 8 electrons. If stability were attained with 6 electrons rather than 8; what would be the formula of the stable fluoride ion?

(1) F^- (2) F^+

(3) F^{2+} (4) F^{3+}

Answer (2)

95. When two ice cubes are pressed over each other, they unite to form one cube. Which of the following forces is responsible to hold them together?

(1) Dipole forces (2) van der Waal forces

(3) Covalent forces (4) Hydrogen bond forces

Answer (4)

96. In which of the following reactions, there is no change in valency ?

(1) $SO_2 + 2H_2S = 2H_2O + 3S$ (2) $2Na + O_2 = Na_2O_2$

(3) $Na_2O + H_2SO_4 = Na_2SO_4 + H_2O_2$ (4) $4KClO_3 = 3KClO_4 + KCl$

Answer (3)

97. If helium is allowed to expand in vacuum, it liberates heat because

(1) Helium is an inert gas

(2) Helium is an ideal gas

(3) The critical temperature of helium is very low

(4) Helium is one of the lightest gases

Answer (3)

98. Compound A undergoes Cannizzaro reaction and B undergoes positive iodoform test. Therefore,

(1) A = Acetaldehyde B = 1-Pentanal

(2) A = $C_6H_5CH_2CHO$ B = 3-Pentanone

(3) A = Formaldehyde B = 2-Pentanone

(4) A = Propionaldehyde B = 1-Pentanol

Answer (3)

99. Arrange the following free radicals in order of decreasing stability :

Methyl (I), Vinyl (II), Allyl (III), Benzyl (IV)

(1) I > II > III > IV (2) III > II > I > IV

(3) II > I > IV > III (4) IV > III > I > II

Answer (4)

100. Which isomer of hexane has only two different sets of structurally equivalent hydrogen atoms?

(1) 2, 2-dimethyl butane (2) 2-methylpentane

(3) 3-methylpentane (4) 2, 3-dimethyl butane

Answer (4)