SOLUTION & ANSWER FOR KCET-2009
VERSION – A1
[PHYSICS]

1. The number of significant figures in the numbers 4.8000×10^4 ----

Ans: 5 and 7

Sol: $4.8000 \times 10^4 \rightarrow$ 5 significant digits
48000.50 $\rightarrow$ 7 significant digits

2. β-decay means emission of electron ---

Ans: Radioactive nucleus

3. An electric heater rated 200 V and 550 W is connected ---

Ans: 2.5 A

Sol: $I = \frac{P}{V} = \frac{550}{220} = 2.5$ A

4. A body of mass \`m' moving along a straight line covers half the distance with a speed of 2 ms^{-1} ---

Ans: $\frac{8}{3} ms^{-1}$

Sol: $v_1 = 2\ ms^{-1}$
$v_2 = 3\ ms^{-1}$, $v_3 = 5\ ms^{-1}$
$v_3' = \frac{3+5}{2} = 4\ ms^{-1}$
$v_{AV} = \frac{2v_1v_3'}{(v_1+v_3')} = \frac{2\times2\times4}{(2+4)}$
$= \frac{8}{3} ms^{-1}$

5. The moment of inertia of a circular ring of radius ------

Ans: $\frac{Mr^2}{2}$

6. A body of mass 0.05 kg is observed to fall with an acceleration of ---

Ans: 0.015 N

Sol: F = m(g – a) = 0.05 (9.8 – 9.5)
$= 0.05 \times 0.3$
= 0.015 N

7. The colloidal solution in which both the dispersed phase and -----

Ans: Emulsion

8. In fog, photographs of the objects taken with infrared radiations ---

Ans: Scattering of IR light is less than visible light.

9. Three concurrent co-planar forces 1 N, 2 N and 3 N ---

Ans: Cannot keep the body in equilibrium.

Sol: if 2 N and 1 N act in same direction, and 3 N acts in opposite direction, equilibrium is possible.

10. Sound waves transfer ---

Ans: Both energy and momentum.

11. Two rectangular blocks A and B of masses 2 kg and 3 kg respectively -----

Ans: 0.05 m

Sol: Initial momentum = $2 \times 0.15 = 0.3$ kg ms^{-1}
If \`v' is the velocity of each block under maximum compression, then
$v = \frac{p}{(m_1+m_2)} = \frac{0.3}{2+3} = \frac{0.3}{5} = 0.06$ m/s
Difference in energy = $\frac{1}{2}kx^2$
$0.0135 = \frac{1}{2}kx^2$
x = 0.05 m

12. G.P. Thomson experimentally confirmed the existence of matter waves ---

Ans: Diffraction.

13. The resistance of a wire at 300 K is found to be 0.3 Ω -----

Ans: No correct choice.

Sol: $\alpha = \frac{R_2 - R_1}{R_1t_2 - R_2t_1}$
$1.5 \times 1^{-3} = \frac{0.6 - 0.3}{0.3\times t_2 - 0.6\times27}$
solving $t_2 = 993$ K

14. The work done by a force acting on a body is as shown ----

Ans: 200 J

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Sol: Work done = Area below F – S graph

$= \frac{(15+10)}{2}\times 10+\left(\frac{10+20}{2}\right)\times 5$

= 200 J

15. Two luminous point sources separated by a certain distance are at 10 km ----

Ans: 2.44 m

Sol: $\theta = \frac{1.22\lambda}{d} = \frac{1.22\times 500\times 10^{-9}}{2.5\times 10^{-3}}$

$= 2.44 \times 10^{-4}$ radian

$d = D \times \theta$

$= 10000 \times 2.44 \times 10^{-4}$

= 2.44 m

(Diffraction in circular aperture is not in syllabus)

16. A door of 1.6 m wide requires a force of 1 N to be applied at the free end ----

Ans: 4 N

Sol: $\tau = 1.6 \times 1 = 1.6$ Nm

$F = \frac{\tau}{d} = \frac{1.6}{0.4} = 4$ N

17. 0.1 m^3 of water at 80°C is mixed with 0.3 m^3 of water -----

Ans: 65°C

Sol: 0.1 (80 – t) = 0.3 (– 60)

80 – t = 3 t – 180

$4t = 260 \Rightarrow t = \frac{260}{4} = 65°C$

18. The spectral series of the hydrogen atom that lies in the visible ----

Ans: Balmer series

19. A graph of pressure versus volume for an ideal gas for -----

Ans: Adiabatic process

20. Which of the following statement does not hold god for ----

Ans: The frequency changes when it travels from one medium to another.

21. A planet revolves round the Sun in an elliptical orbit ----

Ans: A

Sol: Speed is maximum, when distance from Sun is minimum

22. Horizontal tube of non-uniform cross-section has radii of 0.1 m ---

Ans: Same at M and N

Sol: $Q = A_1 v_1 = A_2 v_2$

23. A resistor and a capacitor are connected in series with an a.c. source ----

Ans: 13 V

Sol: $V = \sqrt{12^2+5^2}$

= 13 V

24. The amount of heat energy radiated by a metal at temperature \`T' ---

Ans: 81 E

Sol: $E = \sigma T^4$

25. The angle of minimum deviation for an incident light ray on an ---

Ans: $\sqrt{3}$

Sol: $n = \frac{\sin\frac{(A+D)}{2}}{\sin\left(\frac{A}{2}\right)}$, A = D = 60°

$\Rightarrow n = \sqrt{3}$

26. In the following combination of logic gates, the outputs of A, B and C ---

Ans: 1, 1, 0

27. A stationary point source of sound emits sound uniformly in all directions ---

Ans: $\frac{9}{4}$

Sol: $I \propto \frac{1}{d^2}$

$I \propto A^2 \Rightarrow A \propto \frac{1}{d}$

$\therefore \frac{A_1}{A_2} = \frac{9}{4}$

28. A galvanometer of resistance 240 Ω allows only 4% of the main current after connecting ----

Ans: 10 Ω

Sol: $S = \frac{I_g G}{(I-I_g)} = \frac{\frac{4}{100}\times 240}{\frac{96}{100}}$

= 10 Ω

29. The phenomena in which proton flips is ---

Ans: Nuclear magnetic resonance.

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30. $y = 3\sin\pi\left(\frac{t}{2} - \frac{x}{4}\right)$ represents an equation of a progressive wave, where `t' ---

Ans: 10 m

Sol: Comparing with A sin (ωt – Kx)

$v = \frac{\omega}{K} = 2$ m/s

$\therefore$ Distance = $2 \times 5 = 10$ m

31. According to the quark model, it is possible to build ----

Ans: 3 quarks and 3 anti quarks.

32. An α-particle of mass 6.4×10^{-27} kg and charge 3.2×10^{-19} C is situated in a uniform electric field ---

Ans: $4\sqrt{2}\times10^{5}\ ms^{-1}$

Sol: $\frac{1}{2}mv^2 = qE\times S$

$v = \sqrt{\frac{2qES}{m}}$

$= \sqrt{\frac{2\times3.2\times10^{-19}\times1.6\times10^{5}\times2\times10^{-2}}{6.4\times10^{-27}}}$

$= 4\sqrt{2}\times10^{5}\ ms^{-1}$

33. A cylindrical tube open at both the ends has a fundamental frequency of 390 Hz in air ----

Ans: 260 Hz

Sol: $\frac{v}{2L} = 390$

$\frac{v}{4\times\frac{3L}{4}} = f$

$\frac{2\times390}{3} = f = 260$ Hz

34. The surface temperature of the stars is -----

Ans: Wein's displacement law

35. The charge deposited on 4 μF capacitor ----

Ans: 24×10^{-6} C

Sol: 6 μF and 6 μF are in series

$\therefore$ Voltage across 4 μF = 6 V

$\therefore$ $Q = 6 \times 4 \times 10^{-6}$

$= 24 \times 10^{-6}$ C

36. A parallel beam of light is incident on a converging lens parallel to its principal axis. As one moves away from the lens on the other side of the ----

Ans: First increases and then decreases.

Sol: Beam first converges and then diverges.

37. Continuous emission spectrum is ---

Ans: Incandescent electric lamp.

38. A coil of `n' number of turns is wound tightly in the form of a spiral ----

Ans: $\frac{\mu_0 nI}{2(b-a)}\log_e(b/a)$

Sol: No: of turns / unit length = $\frac{n}{(b-a)}$

$\therefore$ at a distance r,

$dB = \frac{\mu_0}{2}\frac{n}{(b-a)r}I\,dr$

$\therefore B = \int_a^b \frac{\mu_0 nI}{2(b-a)}\log_e\left(\frac{b}{a}\right)$

39. A ray of light is incident on a plane mirror at an angle ---

Ans: 60°

Sol: Deviation = 180 – 2i = 180 – 120 = 60°

40. The electric potential at any point x, y, z in metres is ------

Ans: –12 V/m

Sol: $E = \frac{-dV}{dx} = -6x$

$\therefore E_{(2,0,1)} = -12$ V/m

41. Young's double slit experiment gives interference fringes of width 0.3 mm. A thin glass –

Ans: 0.3 mm

Sol: Fringes get shifted but width remains same.

42. Near a circular loop of conducting wire as shown in the figure an electron -----

Ans: Variable

Sol: The flux is increasing initially and then decreases. Hence induced current reverses its direction.

43. Hydrogen atom from excited state comes to the ground state by emitting -----

Ans: $\sqrt{\frac{\lambda R}{\lambda R - 1}}$

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Sol: $\frac{1}{\lambda} = R\left(1 - \frac{1}{n^2}\right)$

$\therefore n = \sqrt{\frac{\lambda R}{\lambda R - 1}}$

44. The magnetic dipole moment of a current ------

Ans: Magnetic field in which it is lying.

Sol: M = 1 NA

45. In ruby laser, the stimulated emission is due -----

Ans: Metastable state to ground state.

Sol: In Ruby Laser, the transition is from E_2 state (Metastable) to E_1 state (ground).

46. A direct current I flows along the length of an infinitely long straight thin -----

Ans: Is zero at any point inside the pipe.

Sol: Ampere's circuital law.

47. A convex lens made of glass has focal length 0.15 m -----

Ans: 0.6 m

Sol: $f_w = 4$ fair (using lens maker's formula)
$= 4 \times 0.15$
$= 0.6$ m

48. Two sources are said to be coherent If they ---

Ans: Having constant phase difference.

49. Three resistors 1 Ω, 2 Ω and 3 Ω are connected to form a triangle -------

Ans: 1 A

Sol: $I = \frac{V}{R} = \frac{3}{3} = 1$ A

50. In a common emitter amplifier the input signal is -----

Ans: Base and Emitter

51. In a radioactive disintegration, the ratio of initial number of atoms -----

Ans: e

Sol: $N = N_0 e^{-\lambda t}$

$t = \frac{1}{\lambda}, \quad \frac{N_0}{N} = e$

52. A ray of light is incident on a surface of glass slab at an angle -----

Ans: $\tan^{-1}\left(1 - \sqrt{\frac{2}{3}}\right)$

Sol: $S = t\frac{\sin(i - r)}{\cos r}$

$\frac{1}{\sqrt{3}} = \frac{\sin(i - r)}{\cos r}$

$= \frac{\sin i \cos r - \cos i \sin r}{\cos r}$

$\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{2}}(1 - \tan r)$

$\frac{\sqrt{2}}{\sqrt{3}} = 1 - \tan r$

$r = \tan^{-1}\left(1 - \sqrt{\frac{2}{3}}\right)$

53. Ferromagnetic materials used in a transformer ----

Ans: High permeability and low hysteresis loss.

54. According to Newton's Corpuscular Theory, -----

Ans: Lesser in a rarer medium.

55. For the constructive interference the path difference between the two ------

Ans: $n\lambda$

Sol: Note: $(2n+1)\frac{\lambda}{2}$ is possible for constructive interference in thin films, Lloyd's single mirror etc.

56. The accurate measurement of emf can ----

Ans: Potentiometer

Sol: Potentiometer is an ideal voltmeter.

57. The kinetic energy of an electron gets tripled, then the -----

Ans: $\frac{1}{\sqrt{3}}$

Sol: $E \propto \frac{1}{\lambda^2} \Rightarrow \lambda' = \frac{\lambda}{\sqrt{3}}$

$E' \Rightarrow 3E$

58. Which of the following is not a thermodynamic -------

Ans: Gas constant

59. Two solid pieces, one of steel and the other of aluminium when immersed ------

Ans: Aluminium piece will weight more.

Sol: Apparent weight in air $\left(1 - \frac{\text{density of liquid}}{\text{density of solid}}\right)$

$$\Rightarrow \frac{W_S}{W_A} = \frac{\left(1 - \frac{\sigma}{\rho_A}\right)}{\left(1 - \frac{\sigma}{\rho_S}\right)} < 1$$

60. The amount of energy released when one microgram ----

Ans: 25 kWh (No correct choice)

Sol: $E = mc^2$

$= 10^{-6} \times 10^{-3} \times (3 \times 10^8)^2$

$= 9 \times 10^7$ J

$\therefore E = \frac{9 \times 10^7}{3.6 \times 10^6}$ kWh

= 25 kWh

(Note:- If the mass in milligram, the answer will be 0.25×10^5 kWh)

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SOLUTION & ANSWER FOR KCET-2009
VERSION – A-3

CHEMISTRY

1. In countries nearer to polar region, the roads are

Ans: to minimize the snow fall

Sol: $CaCl_2$ depresses the FP of ice

2. For the reaction $H_2O(l) \rightleftharpoons H_2O(g)$ at 373K

Ans: $\Delta H = T\Delta S$

Sol: At 373K, $H_2O(l)$ is in equilibrium with $H_2O(g)$

$\therefore\ \Delta G = 0$, then $\Delta H = T\Delta S$

3. A compound of 'A' and 'B' crystallizes in a cubic lattice in which the 'A' atoms

Ans: AB_3

Sol: A occupies corners $= 8 \times \frac{1}{8} = 1$

B occupies face centres $= 6 \times \frac{1}{2} = 3$

$\therefore$ Empirical formula of the compound $= AB_3$

4. In electrophilic aromatic substitution reaction, the nitro group

Ans: decreases electron density at ortho and para positions.

Sol: $-NO_2$ group when present in the benzene nucleus withdraws electrons from ortho and para positions. Thus the electron density at the ortho and para positions decreases. Meta positions become positions of comparatively higher electron density and hence electrophilic attack occurs at meta positions.

5. $CH_3COOH \xrightarrow{LiAlH_4} X \xrightarrow[300°C]{Cu}$

Ans: Aldol

Sol: $CH_3-COOH \xrightarrow{LiAlH_4} \underset{(X)}{CH_3-CH_2OH}$

$\xrightarrow[300°C]{Cu} \underset{(Y)}{CH_3-CHO} \xrightarrow[NaOH]{dilute}$

$\underset{(Z)\ aldol}{CH_3-CHOH-CH_2-CHO}$

6. The best method for the conversion of an alcohol into an alkyl chloride

Ans: $SOCl_2$ in presence of pyridine

Sol: Reaction of alcohol with $SOCl_2$ (thionyl chloride) gives pure alkyl chloride.

$ROH + SOCl_2 \rightarrow RCl + HCl + SO_2$

The other products, being gases, escape leaving behind pure alkyl chloride.

7. The electrophile involved in the sulphonation

Ans: SO_3

Sol: SO_3 produced from concentrated or fuming sulphuric acid acts as the electrophile in sulphonation.

$2H_2SO_4 \rightleftharpoons SO_3 + HSO_4^- + H_3O^+$

8. The carbon–carbon bond length

Ans: In between C_2H_6 and C_2H_4

Sol: The carbon – carbon double bond in benzene is in between that of C – C and C = C; i.e, in between that of C_2H_6 and C_2H_4

9. The compound which is not formed during the dry distillation

Ans: Propanal

Sol: $(HCOO)_2Ca \xrightarrow{\text{dry distillation}} H-CHO + CaCO_3$

$(CH_3COO)_2Ca \xrightarrow{\Delta} CH_3-CO-CH_3 + CaCO_3$

$(HCOO)_2Ca + (CH_3COO)_2Ca \xrightarrow{\Delta} 2CH_3-CHO + 2CaCO_3$

Propanal is not formed.

10. An organic compound X is oxidised by using acidified $K_2Cr_2O_7$.

Ans: $(CH_3)_2CHOH$

Sol: Since the product of oxidation reacts with phenyl hydrazine, it is a carbonyl compound. Since it does not answer silver mirror test, it must be a ketone. Ketones are produced by the oxidation of secondary alcohols. So the compound X is isopropyl alcohol.

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$$(CH_3)_2CHOH + [O] \xrightarrow{\text{acid } K_2Cr_2O_7} \underset{\text{propanone}}{CH_3-CO-CH_3} + H_2O$$

11. The reaction involved in the oil of Winter Green test is Salicylic acid $\xrightarrow[\text{Conc.}H_2SO_4]{\Delta}$

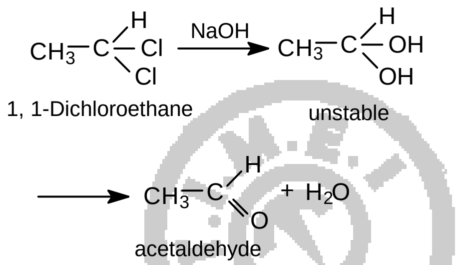
Ans: Methanol

Sol: Methanol reacts with salicylic acid in presence of a few drops of con.H_2SO_4 to form methyl salicylate having the smell of oil of winter green.

12. The compound which forms acetaldehyde when

Ans: 1, 1 Dichloro ethane

Sol:



13. Arrange the following in the increasing order

Ans: $NH_3 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$

Sol: Aliphatic amines are more basic than NH_3 due to the +I effect of alkyl groups. In aqueous solution, $(CH_3)_3N$ (3° amine) is less basic than $(CH_3)_2NH$ because the cation formed by protonation of $(CH_3)_3N$ is less solvated compared to the cation formed by protonation of $(CH_3)_2NH$.

14. The one which has least Iodine

Ans: Ghee

Sol: Ghee is the least unsaturated among the given options.

15. A diabetic person carries a pocket of Glucose

Ans: Glucose increases the blood sugar level almost instantaneously.

Sol: Sometimes the blood sugar level of diabetic patients decreases suddenly. So diabetic patients generally carry a packet of glucose which can increase the blood sugar level almost instantaneously.

16. There are 20 naturally occurring amino acids.

Ans: 8000

Sol: No of tripeptides possible = 20^3 = 8000

17. Cooking is fast in a pressure cooker,

Ans: Water boils at higher temperature inside the pressure cooker.

Sol: Since the pressure is high in the pressure, cooker, water boils at a higher temperature and cooking becomes fast.

18. The ore that is concentrated by Froth Floatation

Ans: Cinnabar

Sol: A sulphide ore (Cinnabar–HgS) is concentrated by froth floatation.

19. The correct set of four Quantum numbers for outermost electron

Ans: 4, 0, 0, $\frac{1}{2}$

Sol: $4s^1$ is the valence electron in potassium.

20. A body of mass x kg is moving with a velocity of 100 ms^{-1}.

Ans: 0.1 kg

Sol: $\lambda = \frac{h}{mv}$

$$m = \frac{h}{\lambda v} = \frac{6.62 \times 10^{-34}}{6.62 \times 10^{-35} \times 100} = 0.1 \text{ kg}$$

21. The correct order of ionisation energy

Ans: C < O < N < F

Sol: F is maximum. N due to stable p^3 configuration comes next.

22. The oxide of an element whose electronic

Ans: Basic

Sol: It is an alkali metal. Alkali metal oxides are basic.

23. The characteristic not related

Ans: High ionisation energy

Sol: Alkali metals have low IE values

24. Among the following, the compound that

Ans: NH_4Cl

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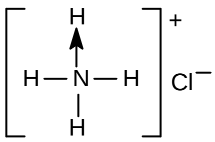
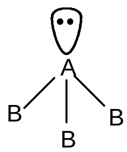
Sol: 

25. A covalent molecule AB_3 has pyramidal structure.

Ans: 1 and 3

Sol: 

26. Excess of carbon dioxide is passed through 50 ml of 0.5 M calcium hydroxide solution.

Ans: 500 cm^3

Sol: No. of millmoles of $Ca(OH)_2 = 50 \times 0.5$
$= 25$
No. of millmoles of $CaCO_3$ = 25
No. of milliequivalence of $CaCO_3$ = 50
$\therefore$ Volume of 0.1 N HCl $= \dfrac{50}{0.1} = 500\ cm^3$

27. A bivalent metal has an equivalent mass of 32.

Ans: 188

Sol: Atomic mass of the metal $= 32 \times 2 = 64$
Formula of metal nitrate is $M(NO_3)_2$
$\therefore$ Molecular mass = 64 + 28 + 96 = 188

28. The r.m.s. velocity of molecules of a gas

Ans: 300 ms^{-1}

Sol: $\mu_{rms} = \sqrt{\dfrac{3P}{d}} = \sqrt{\dfrac{3 \times 1.2 \times 10^5}{4}}$

$= 300\ ms^{-1}$

29. 0.5 mole of each of H_2, SO_2 and CH_4 are kept in a container.

Ans: $P_{SO_2} > P_{CH_4} > P_{H_2}$

Sol: Rate of diffusion $\alpha\ \dfrac{1}{\sqrt{\text{Molecular mass}}}$
Order of diffusion : $H_2 > CH_4 > SO_2$
Amount left is in the order $SO_2 > CH_4 > H_2$
$\therefore$ Order of partial pressure is
$SO_2 > CH_4 > H_2$

30. The enthalpy of formation of NH_3 is –46 kJ mol^{-1}.

Ans: 92 kJ

Sol: For the reaction, $2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$
$\Delta H = -(2 \times$ Enthalpy of formation of $NH_3)$
$= -2 \times -46 = 92$ kJ

31. 5 moles of SO_2 and 5 moles of O_2 are allowed to react.

Ans: 0.41 atm

Sol: $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$

Initial	5	5	0 moles
Eqm.	2	3.5	3 moles

$\therefore P_{O_2} = \dfrac{3.5 \times 1}{8.5} = 0.41$ atm

32. $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

The equilibrium constant of the above reaction is 6.4 at 300K.

Ans: 6.4

Sol: Equilibrium constant remains as a constant for a given reaction at constant temperature.

33. Rate of physical adsorption

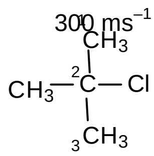
Ans: Decrease in temperature

Sol: With the increase of temperature physical adsorption decreases.

34. IUPAC name of

Ans: 2–Chloro–2–methyl propane

Sol:


: 2-Chloro-2-methylpropane

35. Lucas test is associated

Ans: Alcohols

Sol: Lucas test is used to distinguish 1°, 2° and 3° alcohols.

36. An organic compound on heating with CuO produces CO_2 but no water.

Ans: Carbon tetrachloride

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Sol: Since the compound on heating with CuO produced CO_2, it contains carbon. Since it does not produce water, it does not contain hydrogen. So the compound is CCl_4 (carbon tetrachloride)

37. The condensation polymer

Ans: Protein

Sol: Proteins are the condensation polymers of α–amino acids.

38. The order of stability of metal

Ans: $Fe_2O_3 < Cr_2O_3 < Al_2O_3 < MgO$

Sol:

39. The temperature of the slag zone in the metallurgy

Ans: 800 – 1000°C

Sol: 800 – 1000°C is slag zone

40. The function of $Fe(OH)_3$ in the

Ans: to remove arsenic impurity

Sol: $Fe(OH)_3$ a positive sol removes Arsenic impurity which is a negative sol.

41. In which of the following, NH_3

Ans: Nessler's reagent

Sol: Nessler's reagent is used for detecting ammonia.

42. Argon is

Ans: In high temperature welding

Sol: For creating an inert atmosphere.

43. The incorrect statement in respect of

Ans: Liberation of Chlorine

Sol: No Cl_2 is liberated, it is a test for Cl^- ions.

44. The magnetic moment of a transition metal ion is $\sqrt{15}$ B.M.

Ans: 3

Sol: $n = 3 \quad \therefore \mu = \sqrt{3(3+2)} = \sqrt{15}$

45. The IUPAC name of $[Co(NH_3)_5ONO]^{2+}$

Ans: Pentaamine nitrito cobalt (III) ion

Sol: ONO^- is called nitrito.

46. The oxidation state of Fe in the brown ring

Ans: +2

Sol: NO is neutral ligand

47. The correct statement with regard to

Ans: H_2^+ is more stable than H_2^-

Sol: $\frac{3}{4}\frac{\mu_o i}{2R} \quad \frac{1}{2}\frac{\mu_o i}{2\pi R}$ There is one electron in the antibonding molecular orbital in H_2^-

48. Arrange the following in the increasing order

Ans: O_2^{--}, O_2^-, O_2, O_2^+

Sol:

	O_2^{--},	O_2^-,	O_2,	O_2^+
BO	1	1.5	2	2.5

49. 2 gm of a radioactive sample having half life of 15 days

Ans: 0.125 gm

Sol: 1st Jan 2009 to 1st March 2009 $\rightarrow$ 60 days

$2 \text{ gm} \xrightarrow{15 \text{ days}} 1 \text{ gm} \xrightarrow{15 \text{ days}} 0.5 \text{ gm} \xrightarrow{15 \text{ days}} 0.25 \text{ gm} \xrightarrow{15 \text{ days}} 0.125 \text{ gm}$

50. For a chemical reaction $A \rightarrow B$, the rate of the reaction is 2×10^{-3} mol dm^{-3} s^{-1}, when the initial concentration is 0.05 mol dm^{-3}.

Ans: 3

Sol: Concentration Rate

$\frac{0.1}{0.05} = 2 \text{ times} \qquad \frac{1.6 \times 10^{-2}}{2 \times 10^{-3}} = 8 \text{ times}$

$2^3 = 8$

$\therefore$ Order = 3

51. For the decomposition of a compound AB at 600K,

Ans: 2

Sol: Concentration Rate

$\frac{0.4}{0.2} = 2 \text{ times} \qquad \frac{11 \times 10^{-8}}{2.75 \times 10^{-8}} = 4 \text{ times}$

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$\frac{0.6}{0.2}$ = 3 times $\qquad \frac{24.75 \times 10^{-8}}{2.75 \times 10^{-8}}$ = 9 times

$2^2 = 4$

$\therefore$ Order = 2

52. The rate equation for a reaction: A$\rightarrow$ B is r = K[A]°.

Ans: $\frac{a}{2K}$

Sol: It is given that the reaction is of zero order

$\therefore t_{1/2} = \frac{a}{2K}$

53. 30 cc of $\frac{M}{3}$ HCl, 20 cc of $\frac{M}{2}$ HNO_3 and 40 cc of $\frac{M}{4}$ NaOH

Ans: 2

Sol: Total milli equivalence of $H^+ = 30 \times \frac{1}{3} + 20 \times \frac{1}{2} = 20$

Total milli equivalence of $OH^- = 40 \times \frac{1}{4} = 10$

Milli equivalence of H^+ left = 20 – 10 = 10

$\therefore [H^+] = \frac{10}{1000}$ g– ions/dm^3 = 10^{-2}

$\therefore$pH = 2

54. An aqueous solution containing 6.5 gm of NaCl of 90% purity was subjected to

Ans: 100 cm^3

Sol: Wt. of NaCl = 6.5 $\times$ 0.9 = 5.85 gm

No. of equivalence of NaCl = $\frac{5.85}{58.5}$ = 0.1

No. of equivalence of NaOH obtained = 0.1

Volume of 1M acetic acid required for the neutralisation of NaOH = $\frac{0.1 \times 1000}{1}$ = 100 cm^3

55. The standard electrode potential for the half cell reactions are:

$Zn^{++} + 2e^- \rightarrow Zn \qquad E° = -0.76$ V

$Fe^{++} + 2e^- \rightarrow Fe \qquad E° = -0.44$ V

Ans: +0.32 V

Sol: Cell reaction is $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$

$E_{cell} = Eel_{(oxidation)} + Eel_{(reduction)}$

= 0.76 – 0.44 = 0.32 V

56. 10^{-6} M NaOH is diluted 100 times.

Ans: Between 7 and 8

Sol: $[OH^-]$ in the diluted base = $\frac{10^{-6}}{10^2} = 10^{-8}$

Total $[OH^-] = 10^{-8}$ + $[OH^-]$ obtainable from water.

PH of an alkaline solution is always greater than 7.

57. In the electrolysis of acidulated water, it is desired to obtain 1.12 cc of hydrogen

Ans: 9.65 amp

Sol: No. of moles of $H_2 = \frac{1.12}{22400}$

No. of equivalence of hydrogen

$= \frac{1.12 \times 2}{22400} = 10^{-4}$

No. of Faradays required = 10^{-4}

$\therefore$ Current to be passed in one second

$= 96500 \times 10^{-4}$ Amp

= 9.65 Amp

58. The one which decreases

Ans: Specific conductance

Sol: Number of ions/cc decreases with dilution and hence specific conductance decreases with dilution.

59. Vapour pressure of pure 'A' is 70 mm of Hg at 25°C.

Ans: 140 mm

Sol: $0.8 \times 70 + 0.2 \times P_B^0 = 84$

$P_B^0 = \frac{28}{0.2}$ = 140 mm

60. A 6% solution of urea is isotonic

Ans: 1 M solution of glucose

Sol: $\frac{6}{60} = \frac{x}{180}$

x = 18 g

i.e., 18 g of glucose in 100 mL solution is isotonic with 6% urea solution.

18 g of glucose in 100 mL is 1 M

SOLUTION & ANSWER FOR KCET-2009
VERSION – A-2

[MATHEMATICS]

1. $\int \operatorname{cosec}(x-a)\operatorname{cosec}x\,dx =$

Ans: $\frac{1}{\sin a}\log[\sin(x-a)\operatorname{cosec}x] + C$

Sol. : $\sin[x-(x-a)] = \sin x\cos(x-a) - \cos x\sin(x-a)$

$\therefore \int \operatorname{cosec}(x-a)\operatorname{cosec}x\,dx =$

$\int \frac{dx}{\sin a\sin(x-a)} =$

$\frac{1}{\sin a}\int[\cot(x-a) - \cot x]dx$

$= \frac{1}{\sin a}\log\left[\frac{\sin(x-a)}{\sin x}\right] + C$

$= \frac{1}{\sin a}\log[\sin(x-a)\operatorname{cosec}x] + C$

2. If $f(x) = \int_{-1}^{x}|t|dt$, then …..

Ans: $\frac{1}{2}(1+x^2)$

Sol. : $f(x) = \int_{-1}^{x}|t|dt = \int_{-1}^{0}|t|dt + \int_{0}^{x}|t|dt$

$= \int_{-1}^{0}tdt + \int_{0}^{x}tdt$

$= \frac{1}{2} + \frac{x^2}{2} = \frac{1}{2}(1+x^2)$

3. $\int_{1}^{3}\frac{\sqrt{4-x}}{\sqrt{x}+\sqrt{4-x}}dx =$

Ans: 1.

Sol.: $\int_{a}^{b}\frac{f(x)dx}{f(x)+f(a+b-x)} = \frac{b-a}{2}$

Here a = 1, b = 3

so answer = $\frac{3-1}{2} = 1$

4. The area bounded between the parabola …..

Ans: 9 sq. units.

Sol: Area = $\int_{0}^{1}2\sqrt{4x}dx + \int_{1}^{4}[\sqrt{4x} - (2x-4)]dx$

$= \frac{8}{3} + \frac{28}{3} - 3$

= 9 sq. units.

5. The differential equation of the family of ….

Ans: $y^2 = x^2 + 2xy\,\frac{dy}{dx}$

Sol: The family is $x^2 + y^2 - \lambda x = 0$

$\therefore 2x + 2yy' = \lambda$

$\therefore x^2 + y^2 = (2x + 2yy')x$

$y^2 = x^2 + 2xy\,\frac{dy}{dx}$

6. A population grows at the rate of 10% of the …

Ans: 10log2years

Sol: If p is the population at any time,

$\frac{dp}{dt} = \frac{1}{10}p$

$\frac{dp}{p} = \frac{dt}{10}$

$\log p = c + \frac{t}{10}$

$\log\left(\frac{p}{p_0}\right) = \frac{t}{10}$,

where P_0 = initial population

given $\frac{p}{p_0} = 2$

$\therefore$ t = 10log2years

7. On the set of all natural numbers N, which…

Ans: $a * b = a + 3b$

Sol: obviously, only $a * b = a + 3b$ results in closure property.

8. If $\int_{0}^{1}f(x)dx = 5$, then the value of ….

Ans:

Sol: Question is incomplete

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9. If ax + by = 1, where a, b, x and y are ….

Ans: (x, y) = 1

Sol: It is not possible that (x, y) = 1.

10. The digit in the unit place of the number…..

Ans: 9.

Sol: 2009! ends in zero.
Last digit of 3^{7886} is same as last digit of 3^2 since last digit repeats in steps of 4.

11. If $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$, then

Ans: in A. P.

Sol: Observe that $R_1 + R_3 = 2R_2$ for the first two columns.
since determinant is zero,
same must be true for column 3.
$\therefore$ a + c = 2b.
$\therefore$ a, b, c are in A.P.

12. The value of $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ …

Ans: 0.

Sol: $\log_x y = \dfrac{\log y}{\log x}$

$\therefore$ determinant

$$= \frac{1}{\log x \log y \log z}\begin{vmatrix} \log x & \log y & \log z \\ \log x & \log y & \log z \\ \log x & \log y & \log z \end{vmatrix} = 0$$

13. If A = $\begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ ….

Ans: 81.

Sol: $|A| = 9$

$\therefore |\text{adj}A| = |A|^2 = 81.$

14. If A and B are square matrices of ….

Ans: B^2

Sol: $(ABA^{-1})^2 = (ABA^{-1})$

15. If $\vec{a}.\vec{b} = -|\vec{a}||\vec{b}|$, then the …..

Ans: 180°.

Sol: $\vec{a}.\vec{b} = |\vec{a}||\vec{b}|\cos\theta$

$\Rightarrow \cos\theta = -1$
$\Rightarrow \theta = 180°$.

16. If $\vec{a} + 2\vec{b} + 3\vec{c} = \vec{O}$, then ….

Ans: $3(\vec{c} \times \vec{a})$ and $6(\vec{b} \times \vec{c})$

Sol: $\vec{a} + 2\vec{b} + 3\vec{c} = \vec{O}$

$\vec{a} \times (\vec{a} + 2\vec{b} + 3\vec{c}) = 2\vec{a} \times \vec{b} - 3\vec{c} \times \vec{a} = 0$

$\vec{b} \times (\vec{a} + 2\vec{b} + 3\vec{c}) = -\vec{a} \times \vec{b} + 3\vec{b} \times \vec{c} = 0$

$\vec{c} \times (\vec{a} + 2\vec{b} + 3\vec{c}) = \vec{c} \times \vec{a} - 2\vec{b} \times \vec{c} = 0$

adding,

$\vec{a} \times \vec{b} - 2\vec{c} \times \vec{a} + \vec{b} \times \vec{c} = 0$

$\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a} = 3\vec{c} \times \vec{a}$

Also, we can verify that $6(\vec{b} \times \vec{c})$ is also true.

17. If the volume of the parallelepiped …..

Ans: 80.

Sol: $[\vec{b} + \vec{c},\ \vec{c} + \vec{a},\ \vec{a} + \vec{b}] = 2[\vec{a}, \vec{b}, \vec{c}]$
$= 2 \times 40$
$= 80$.

18. In the group G = {0, 1, 2, …….} …..

Ans: 3.

Sol: $3^{-1} = 3$
$(2 \oplus_6 3^{-1} \oplus 4)^{-1} = 3^{-1} = 3$

19. Which one of the following …..

Ans: Fourth roots of unity form an additive abelian group.

Sol: Obviously, fourth roots of unity form an abelian group under multiplication and not under addition.

20. The number of sub groups …..

Ans: 2

Sol: Z_n will have only two sub-groups since it is a group of prime order.

21. The negation of …..

Ans: $\sim p \vee (q \wedge r)$.

Sol: question is printed wrongly.
if it is $p \wedge (q \rightarrow \sim r)$, then the answer is $\sim p \vee (q \wedge r)$.

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22. If n = 2020, then ----

Ans: 1

Sol: $\log_n(2\times 3\times \ldots\times 2020) = \log_n n = 1$

23. If `n' is a positive integer, then $n^3 + 2n$ is ----

Ans: 3

Sol: $n(n^2 + 2) = n(n^2 - 1 + 3)$
$= n[(n-1)(n+1) + 3]$
$= n(n-1)(n+1) + 3n$
$= M(3)$.

24. On the set of integers Z, define $f : Z \to Z$ as ----

Ans: surjective but not injective

Sol: Obviously, f is surjective but not injective.

25. If α and β are the roots of $x^2 + x + 1 = 0$, ----

Ans: -1

Sol: $\alpha^{16} + \beta^{16} = \omega^{16} + (\omega^2)^{16}$
$\omega + \omega^2 = -1$.

26. The total number of terms in the expansion of $(x + y)^{100} + (x - y)^{100}$ ----

Ans: 51.

Sol: There are 101 terms in each expansion.
But even ordered terms will cancel.
After simplification, 51 terms will remain.

27. $\cot^{-1}(2.1^2) + \cot^{-1}(2.2^2)$ --------

Ans: $\dfrac{\pi}{4}$

Sol: nth term $= \cot^{-1} 2n^2$
$= \tan^{-1}\dfrac{1}{2n^2}$
$= \tan^{-1}\dfrac{2}{4n^2}$
$= \tan^{-1}\dfrac{(2n+1)-(2n-1)}{1+(2n+1)(2n-1)}$
$= \tan^{-1}(2n + 1) - \tan^{-1}(2n - 1)$
So, sum to n terms
$= \tan^{-1}(2n + 1) - \tan^{-1} 1$
sum to $\infty = \dfrac{\pi}{4}$.

28. If `x' takes negative permissible value, ----

Ans: $-\cos^{-1}\sqrt{1-x^2}$

Sol: We have $-1 \le x \le 0$
$\therefore \sin^{-1}x$ is a negative acute angle
$\therefore \sin^{-1}x = -\cos^{-1}\sqrt{1-x^2}$

29. If $1 + \sin x + \sin^2 x + \ldots$ up to ∞ ----

Ans: $\dfrac{\pi}{3}, \dfrac{2\pi}{3}$

Sol: $\dfrac{1}{1-\sin x} = 4 + 2\sqrt{3} = \dfrac{4}{4-2\sqrt{3}}$

$1 - \sin x = 1 - \dfrac{\sqrt{3}}{2}$

$\Rightarrow \sin x = \dfrac{\sqrt{3}}{2}$

$\Rightarrow x = \dfrac{\pi}{3}, \dfrac{2\pi}{3}$.

30. The complex number $\dfrac{1+2i}{1-i}$ -------

Ans: second quadrant

Sol: $\dfrac{(1+2i)(1+i)}{2} = \dfrac{-1}{2} + \dfrac{3}{2}i$

31. If P is the point in the Argand diagram corresponding to the complex number -------

Ans: $-1 + i\sqrt{3}$ or $1 - i\sqrt{3}$

Sol: P is $\sqrt{3} + i = 2\left(\cos\dfrac{\pi}{6} + i\sin\dfrac{\pi}{6}\right)$

Q_1 is $2\left[\cos\left(\dfrac{\pi}{2}+\dfrac{\pi}{6}\right) + i\sin\left(\dfrac{\pi}{2}+\dfrac{\pi}{6}\right)\right]$

$= 2\left(-\sin\dfrac{\pi}{6} + i\cos\dfrac{\pi}{6}\right)$

$= 2\left(-\dfrac{1}{2} + i\dfrac{\sqrt{3}}{2}\right) = -1 + i\sqrt{3}$

Q_2 is $2\left[\cos\left(\dfrac{\pi}{6}-\dfrac{\pi}{2}\right) + i\sin\left(\dfrac{\pi}{6}-\dfrac{\pi}{2}\right)\right]$

$= 1 - i\sqrt{3}$.

32. The smallest positive integral value of `n' such that -----

Ans: 4

Sol: $\left[\dfrac{2\cos\dfrac{3\pi}{16}\left[i\dfrac{3\pi}{6}\right]}{2\cos\dfrac{3\pi n}{16}\,e^{-i}\dfrac{3\pi}{16}}\right]^n = e^i\dfrac{3\pi}{8}n$

$\cos\dfrac{3\pi n}{8} = 0 \Rightarrow \dfrac{3n\pi}{8} = 3\dfrac{\pi}{2}$

$\Rightarrow n = 4$.

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33. Which one of the following is possible ---

Ans: $\tan\theta = 45$

Sol: $-\infty < \tan\theta < \infty$

34. If one side of a triangle is double the other and the angles opposite -----

Ans: right angled

Sol: $\frac{a}{\sin\theta} = \frac{2a}{\sin(\theta+60)} \Rightarrow$

$2\sin\theta = \sin(\theta + 60) \Rightarrow$

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

$\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30° \Rightarrow$

$\theta + 60 = 90°$.

35. $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2$ -----

Ans: 13.

Sol: $(1 - \sin 2x)^2 + 6(1 + \sin 2x)$

$+ 4(1 - \frac{3}{4}\sin^2 2x)$

$= 13.$

36. A cow is tied to a post by a rope. The cow moves along the -----

Ans: 35 metres

Sol: $s = r\theta$

$44 = r\frac{72\times\pi}{180} \Rightarrow r = 35.$

37. If $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 2\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 2\theta \\ \sin^2\theta & \cos^2\theta & 4\sin 2\theta - 1 \end{vmatrix}$ ----

Ans: $\frac{1}{2}$

Sol: $\Delta = \begin{vmatrix} 2 & \cos^2\theta & 4\sin^2\theta \\ 2 & 1+\cos^2\theta & 4\sin 2\theta \\ 1 & \cos^2\theta & 4\sin 2\theta - 1 \end{vmatrix} = 0$

$C_1 \to C_1 + C_2$

$= \begin{vmatrix} 2 & \cos^2\theta & 4\sin 2\theta \\ 0 & 1 & 0 \\ 0 & \frac{1}{2}\cos^2\theta & 2\sin 2\theta - 1 \end{vmatrix} = 0$

$2(2\sin 2\theta - 1) = 0 \Rightarrow \sin 2\theta = \frac{1}{2} \Rightarrow$

$\cos 4\theta = 1 - 2\times\frac{1}{4} = \frac{1}{2}.$

38. The locus of the mid points of the chords of the circle -----

Ans: $x^2 + y^2 = 2.$

Sol: Mid point of the chord joining (2, 0), (0, 2) subtending 90° at the origin.
Equation of the locus is $x^2 + y^2 = 1^2 + 1^2 = 2.$

39. The length of the chord joining the points ($4\cos\theta$, $4\sin\theta$) -------

Ans: 4.

Sol: $4\sqrt{2 - 2[(\cos(\theta+60)\cos\theta + \sin(\theta+60)\sin\theta)]}$

$= 4\sqrt{2}\sqrt{1-\cos 60} = 4.$

40. The number of common tangents to the circles ----------

Ans: 3.

Sol: The circles touches externally. Hence there will be 3 common tangents.

41. The co-ordinates of the centre of the smallest circle -----

Ans: $\left(-\frac{1}{2}, \frac{1}{2}\right)$

Sol: Back substitution

42. The length of the diameter of the circle which cuts -----

Ans: 4

Sol: $-g - f = c - 14$
$3g - 5f = c - 10$
$-2g + 3f = c - 27 \Rightarrow$
$g = -3, f = -4, c = 21$
Diameter $= 2\sqrt{9 + 16 - 21} = 4.$

43. For the parabola $y^2 = 4x$, the point P whose focal ------

Ans: (16, 8) or (16, –8)

Sol: Focus = (1, 0)
The only points distant 17 from (1, 0) are (16, 8) and (16, –8).

44. The angle between the tangents drawn to the parabola $y^3 = 12x$ from the ------

Ans: 90°

Sol: $y^2 = 12x$; $a = 3$
$x + 3 = 0$ is the direction.

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(–3, 2) lies on the direction ⇒ the tangents are ⊥
∴ the angle between the tangents = 90°

45. The number of values of `c' such that the line ----

Ans: 2

Sol: y = mx + c
$c^2 = a^2m^2 + b^2$
= 4(16) + 1
= 65
$c = \pm\sqrt{65}$
There are two values for c.

46. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ ------

Ans: $x_1 + x_2 + x_3 + x_4 = 0$

Sol: $x^2 + y^2 = a^2$
$xy = c^2$
$x^{2++}\left(\frac{c^2}{x}\right)^2 = a^2$
$\Rightarrow x^4 - a^2x^2 + c^4 = 0$
⇒ sum of roots = 0
$\Rightarrow x_1 + x_2 + x_3 + x_4 = 0$

47. The foot of the perpendicular from the point (2, 4) -----

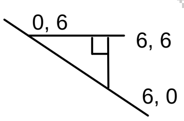
Ans: (1, 3)

Sol: The foot of the ⊥ from (2, 4) upon x + y = 4 is (h, k) and it is given by
$\frac{h-2}{1} = \frac{k-4}{1} = -\frac{2+4-4}{1+1}$
h – 2 = –1 ; k – 4 = –1
h = 1, k = 3
(1, 3) is the point required.

48. The vertices of a triangle are (6, 0), (0, 6) and 96, 6) …..

Ans: $\sqrt{2}$

Sol:



The given Δ is at right angled one.
Circumcentre is the mid point of the hypotenuse
∴ s= (3, 3)
a= (4, 4)
sa = $\sqrt{1+1} = \sqrt{2}$

49. The angle between the pair of lines ----

Ans: $\frac{\pi}{2}$

Sol: x^2 – coeff + y^2 – coeff = 0
⇒ Lines are ⊥

50. $\lim_{n\to\infty}$ -------

Ans: $\frac{-20}{7}$

Sol: $\lim_{n\to\infty} \frac{3.2^n.2 - 4.5^n.5}{5.2^n + 7.5^n}$

$\lim_{n\to\infty} \frac{6\left(\frac{2}{5}\right)^n - 20}{5\left(\frac{2}{5}\right)^n + 7}$

$= \frac{-20}{7}\left(\because \left(\frac{2}{5}\right)^n \to 0 \text{ as } n \to \infty\right)$

51. The function
$f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$

Ans: a + b

Sol: f(x) is continuous at x = 0
$\Rightarrow \lim_{x\to\infty} f(x) = f(0)$
$\therefore f(0) - \lim_{x\to\infty} \frac{\log(1+ax) - \log(1-bx)}{x}$
$= \lim_{x\to\infty}\left[\frac{\log(1+ax)}{ax}a - \frac{\log(1-bx)}{-bx}(-b)\right]$
= a – (–b) = a + b

52. If $f(x) = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}$ ----

Ans: $n(n-1)2^{n-2}$

Sol: $f(x) = (1 + x)^n$
$f'(x) = n(1 + x)^{n-1}$
$f''(x) = n(n-1)(1 + x)^{n-2}$
$f''(1) = n(n-1)2^{n-2}$

53. if $f(x) = \log_{x}{}^{2} (\log_e{}^{x})$, then ---

Ans: $\frac{1}{2e}$

Sol: $f(x) = \log_{x^2}(\log x)$
$= \frac{\log(\log x)}{2\log x}$

$f'(x) = \frac{1}{2}\frac{\log x\frac{1}{x\log x} - \frac{\log(\log x)}{x}}{(\log x)^2}$

$f'(e) = \frac{1}{2}\frac{\left[1.\frac{1}{e} - 0\right]}{1} = \frac{1}{2e}$.

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54. If y = $\sin^n x \cos nx$, then -----

Ans: $n\sin^{n-1}x\{\cos(n+1)x\}$

Sol: $y = \sin^n x \cos nx$

$$\frac{dy}{dx} = n\sin^{n-1}x\cos x\cos nx$$
$$+ \sin^n x.(-n\sin nx)$$
$$= n.\sin^{n-1}x\{\cos nx\cos x - \sin x\sin nx$$
$$= n\sin^{n-1}x\{\cos(n+1)x\}$$

55. If f(x) = $\dfrac{g(x)+g(-x)}{2} + \dfrac{2}{[h(x)+h(-x)]-1}$ ----

Ans: 0

Sol: $f(x) = \frac{1}{2}[g(x)+g(-x)] + 2[h(x)+h(-x)]$

$f'(x) = \frac{1}{2}[g'(x)-g'(-x)] + 2[h'(x)-h'(-x)]$

$f'(0) = 0$

56. The tangent to a given curve y = f(x) is ----

Ans: $\frac{dx}{dy} = 0$

Sol: Conceptual

Tangent is parallel to x – axis

$\Rightarrow \frac{dy}{dx} = 0$

$\therefore$ Tangent || to y – axis

$\Rightarrow \frac{dx}{dy} = 0$

57. The minimum value of $27^{\cos 2x}\ 81^{\sin 2x}$ ---

Ans: $\frac{1}{243}$

Sol: Let y = $27^{\cos 2x}.\ 81^{\sin 2x}$

log y' = cos 2x log 27 + sin 2x log 81

Minimum of log y = $-\sqrt{(\log 27)^2 + (\log 81)^2}$

$= -\sqrt{3^2(\log 3^2 + 4^2(\log 3)^2)} = -5\log 3$

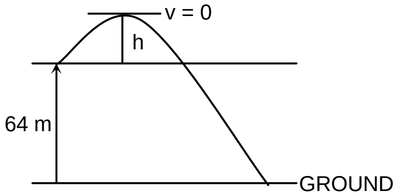
$= \log\left(\frac{1}{243}\right)$

$\therefore$ Minimum y = $\frac{1}{243}$

58. A stone is thrown vertically upwards from the top of a tower 64 metres ----

Ans: 100 m

Sol:



v = 0

$\Rightarrow \frac{dS}{dt} = 0$

$\Rightarrow$ 48 – 32 t = 0

$\Rightarrow t = \frac{3}{2}$

$\therefore\ (S)_{t=\frac{3}{2}}$ = 36 m (height attained from the tower)

$\therefore$ Height attained from the ground

= 36 + 64 = 100 m

59. The length of the subtangent at `t' on the curve --

Ans: a sint

Sol: y = a (1 – cos t)

x = a (t + sint)

$\frac{dy}{dt} = \frac{a\sin t}{a(1+\cos t)}$

$= \tan\frac{t}{2}$

sub tangent = $\frac{y}{y'} = \frac{a(1-\cos t)}{\tan\frac{t}{2}}$

60. $\int e^{\tan-1}\left(1+\frac{x}{1+x^2}\right)dx$ ---

Ans: $x\,e^{\tan-1x}.x + c$

Sol: Put x = tanθ

$I = \int e^{\theta}\left(1+\frac{\tan\theta}{\sec^2\theta}\right)\sec^2\theta d\theta$

$= \int e^{\theta}(\sec^2\theta + \tan\theta)d\theta$

$= e^{\theta}\tan\theta + c$

$= e^{\tan-1x}.x + c$

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SOLUTION & ANSWER FOR KCET-2009
VERSION – A1
[BIOLOGY]

1. Which of the following hormones does ----

Ans: 2, 4 - D

Sol: 2, 4 – D is a synthetic plant growth regulator.

2. A large quantity of fluid is filtered every day by the nephrons ----

Ans: Is reabsorbed into the blood.

Sol: Only a part of the fluid is excreted along with waste material.

3. When DNA replication ---

Ans: The hydrogen bonds between the nucleotide of the two strand break.

Sol: Single stranded DNA acts as template.

4. Fleshy fruits with stony endocarp ---

Ans: Drupe.

Sol: Mango and coconut are the common examples of drupe.

5. Which statement about photosynthesis ----

Ans: The enzymes required for carbon fixation are located only in the grana of the chloroplast.

Sol: Enzymes for carbon fixation are found in stroma.

6. Darwinism explains all the ----

Ans: Variations are inherited from parents to offspring through genes.

Sol: Darwin could not explain inheritance of variation.

7. Pollen grains of a plant whose 2n = 28 are cultured to get callus ----

Ans: 14

Sol: Pollen grains are haploid.

8. A true breeding plant producing red flowers is crossed with a pure plant producing ------

Ans: $\frac{1}{4}$

Sol: In F_2 generation dominant and recessive characters appear in 3 : 1 ratio.

9. Which of the following prevents the conversion of prothrombin to thrombin ----

Ans: Heparin

Sol: Heparin is an anticoagulant.

10. The characteristic that is shared by ureas, uric acid ----

Ans: A only

Sol: Urea, uric acid and ammonia are nitrogenous waste products.

11. A RBC and a plant cell (with thick cell wall) are placed in distilled water ----

Ans: The RBC would increase in size and burst while plant cell would remain about the same size.

Sol: Endosmosis in plant cell is stopped due to the presence of rigid cell wall.

12. Which of the following hormones does not contain -----

Ans: Prostaglandins

Sol: Prostaglandins is a steroid hormone/

13. Ribose sugar is present ---

Ans: RNA and ATP.

Sol: RNA polymerase is protein.

14. Most of the endangered species are the victims ----

Ans: Habitat destruction

Sol: Habitat destruction is the main cause of extinction.

15. Damage to thymus in a child may lead ---

Ans: Loss of cell mediated immunity.

Sol: T-lymphocytes mature in thymus.

16. The diagram of the section of a maize grain is given below. ----

Ans: A – Endosperm, B – Coleoptile, C – Scutellum, D – Aleurone layer

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Sol: Scutellum is the single cotyledon and aleurone layer is the protein separation layer of embryo and endosperm in monocot seed.

17. Examples for lateral meristems ---

Ans: Fascicular cambium and cork cambium

Sol: They are responsible for growth in girth.

18. Vitellogenesis occurs during the ------

Ans: Primary Oocyte in the graffian follicle.

Sol: Vitellogenisis is production of yolk

19. A bacterium is capable of withstanding extreme heat, ----

Ans: Endospore

Sol: Endospore are thick resistant structures.

20. In the absence of enterokinase, the digestion ----

Ans: Albumin

Sol: Albumin is a protein.

21. The greatest threat to genetic diversity ---

Ans: Introduction high yielding varieties.

Sol: Improved varieties lack genetic variation.

22. Nosema bombycis which cause pebrine ----

Ans: Protozoan

Sol: The disease is characterized by pepper like black spots on body.

23. Paleontologists unearthed a human skull during excavation. A small fragment of the scalp ---

Ans: Subjecting DNA to polymerase chain reaction.

Sol: PCR is a method to amplify the desired DNA.

24. Which of the following would be in insignificant ----

Ans: Sugar

Sol: Xylem mainly conduct water and mineral.

25. If the person shows the production of interferons in his ----

Ans: Measles

Sol: Measles is a viral disease.

26. The RER in the cell synthesized a protein which would be later used in building the plasma membrane ---

Ans: D

Sol: Protein are modified in golgi bodies.

27. The respiratory quotient during cellular respiration would depend on ----

Ans: Nature of substrate

Sol: RQ depends on the respiratory substrate.

28. Which of the following is not a green ---

Ans: Oxygen

Sol: CO_2, methane and water vapour are green house gases.

29. Both husband and wife have normal vision though their fathers were colour blind ----

Ans: 0%

Sol: 50% of the sons will be colour blind.

30. An animal which has both exoskeleton and -----

Ans: Tortoise

Sol: Jelly fish lack both exo and endoskeleton. Frog has only endoskeleton and fresh water mussel has only exoskeleton.

31. 2n = 16 in a primary spermatocyte which is in metaphase of first meiotic ----

Ans: 16

Sol: Secondary spermatocytes are haploid.

32. Identify the group which includes animals all of which -----

Ans: Dolphin, Kangaroo, Bat, Cat.

Sol: All are mammals.

33. Compare the statements A and B:
Statement A: Blood sugar level falls ------

Ans: Both statement A and B are correct and B is the reason for A.

Sol: Hepatotomy block supply of sugar.

34. What is /are true about heart ---

Ans: A and D

Sol: Sap wood is called alburnum which is light in colour and soft.

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35. Compare the statements A and B ----
Statement A: Auxins promote apical ----

Ans: Both the statements A and B are correct and A is the reason for B.

Sol: Moriculture is mulberry culture.

36. Bryophytes resemble algae in the following aspects: ----

Ans: Thallus like plant body, lack of vascular tissues and autotrophic nutrition.

Sol: Bryophytes are non vascular plants.

37. Compare the statements A and B:
Statement A: A monocistronic mRNA can produce ------

Ans: Statement A is wrong and B is correct.

Sol: Polycistronic mRNA produce several polypeptide chain.

38. Stoma opens when -----

Ans: Guards cells swells due to a decrease in their water potential.

Sol: Water potential of guard cells decrease due to the influx of K^+ ions.

39. Which of the following is properly

Ans: Echinodermata – Asteroidea – Star fish

Sol: Spider belongs to Arachnida, unio belongs to pelecypoda and planaria belong

40. A man is admitted to a hospital. He is suffering from an abnormally ----

Ans: Hypothalamus

Sol: Hypothalamus control body temperature and thirst.

41. Identify the incorrect statement with respect to Calvin cycle
(1) the first stable -----

Ans: 18 molecules of ATP are synthesized during carbon fixation.

Sol: 18 molecules of ATP are used in carbon fixation.

42. The agents which are known to cause CJD ---

Ans: Protein particles

Sol: Creutzfeldt – Jacob Disease (CJD), is prion disease seen in humans causing degeneration of brain.

43. In crop improvement programmes, virus – free clones can be ----

Ans: Shoot apex culture

Sol: Shoot apical meristem is devoid of viral infection.

44. A person is suffering from frequent episodes of nasal discharge, -----

Ans: Rhinitis

Sol: Rhinitis is also known as hay fever.

45. Some important events in the human female reproductive -----

Ans: $A \rightarrow C \rightarrow E \rightarrow D \rightarrow B$

Sol: Human female reproductive sequence of cycle are secretion of FSH $\rightarrow$ Growth of the follicle and oogenesis $\rightarrow$ Sudden increase in the level of LH $\rightarrow$ ovulation $\rightarrow$ Growth of corpus luteum.

46. Compare the statements A and B
Statement A: Ranikhet disease is ---

Ans: Both the statements A and B are correct.

Sol: Ranikhet disease in poultry is due to the infection of *paramyxo* virus.

47. The offspring produced from a marriage have only O or A blood groups -----

Ans: $I^A I^o$ and $I^o I^o$

Sol: Since the offsprings are of O and A blood groups, one of the parent must be of heterozygous A blood ($I^A I^o$) and the other of homozygous O blood ($I^o I^o$)

48. A dorsal horn is present on the -------- of mulberry ------

Ans: 8^{th} Abdominal segment

Sol: Caterpillar of silk worm possess a dorsal horn on the 8^{th} segment of thorax.

49. A plant has an androecium with monadelphous stamens, monothecous -----

Ans: *Hibiscus*

Sol: Monadelphous stamens, monothecous and reniform anther lobes are seen in malvaceae family.

50. Transpiration facilitates -----

Ans: Absorption of water by roots.

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Sol: Transpiration results loss of water, which in turn cause lowering of 4W in leaves and finally into the root through the stem. This causes water absorption.

51. The cross section of the body of an invertebrate ----

Ans: Planaria

Sol: Flat worms are devoid of cavities in between the alimentary canal and body wall, hence are acoelomate.

52. In an experiment demonstrating the evolution ---

Ans: Amount of oxygen evolved increases as the availability of carbon dioxide increases.

Sol: Addition of $NaHCO_3$ causes the availability of CO_2 for photosynthesis and result more O_2 evolution.

53. Which substances is in higher concentration ----

Ans: Plasma proteins

Sol: Glomerular filtration is the first step of urine formation.

54. All the following are included under in situ ----

Ans: Botanical garden.

Sol: Botanical garden is an example for *ex situ* conservation.

55. Match the compounds given in column – 1 with the number of carbon atoms present in them which are listed under ------

Ans: A = r, B = s, C = p, D = q

Sol: Oxaloacetate – 4C compound,
Phosphoglyceraldehyde – 3C compound
Isocitrate – 6C compound,
α-ketoglutarate – 5C compound

56. Identify the correctly matched pair/pairs of the germ layers
A. Ectoderm – Epidermis -----

Ans: A, C and D only

Sol: Ectoderm – epidermis,
Mesoderm – muscles and notochord.

57. Identify the correct statement:
(1) The age of the plant can be ----

Ans: Grafting is difficult in monocot plants as they have scattered vascular bundles.

Sol: Vascular bundles with cambium is necessary for grafting and in monocot, no such cambium is present in the bundles.

58. Blood stains are found at the site of a murder ----

Ans: Leucocytes

Sol: Leucocytes are nucleated where as erythrocytes are enucleated.

59. During endocytosis,
(1) the cell digests itself -----

Ans: The cell engults and internalises materials using its membrane.

Sol: Solid substances are phagocytised by the plasma membrane and is known as endocytosis.

60. Match the names of the economically important plants (or their products) listed in ----

Ans: A = q, B = r, C = s, D = p

Sol: Sunflower – compositae (Asteraceae),
Tulsi – Labiatae (Lamiaceae),
Coffee – Rubiaceae,
Vasaka - Acanthaceae

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