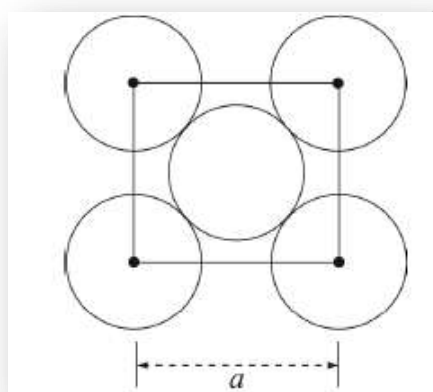


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Undergraduate Admission Test 2022: Chemistry Honours

Full Marks : 150

Time : 2 hours

- How many moles of electrons weighs one kilogram? [$m_e = 9.108 \times 10^{-31}$ kg]
 (a) 6.022×10^{23} (b) $\frac{1}{9.108} \times 10^{31}$ (c) $\frac{6.022}{9.108} \times 10^{54}$ (d) $\frac{1}{6.022 \times 9.108} \times 10^8$
- Equal masses of ethane and hydrogen are mixed in an empty container at 25°C . The fraction of the total pressure exerted by hydrogen is
 (a) $\frac{1}{2}$ (b) 1 (c) $\frac{1}{16}$ (d) $\frac{15}{16}$
- The r.m.s. speed of hydrogen at temperature T_1 is $\sqrt{7}$ times the r.m.s. speed of nitrogen at temperature T_2 . If T is the temperature of the gas in absolute scale, then,
 (a) $T_1 = T_2$ (b) $T_1 > T_2$ (c) $T_1 < T_2$ (d) $T_1 = \sqrt{7} T_2$
- The packing efficiency of the two-dimensional square unit cell shown below is



- (a) 39.27% (b) 68.02% (c) 74.05% (d) 78.54%
- Using the data provided, calculate the bond energy of the Carbon-Carbon triple bond in C_2H_2 .

$$2\text{C}(\text{s}) + \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_2(\text{g}) \quad \Delta H_1 = 225 \text{ kJ mol}^{-1}$$

$$2\text{C}(\text{s}) \rightarrow 2\text{C}(\text{g}) \quad \Delta H_2 = 1410 \text{ kJ mol}^{-1}$$

$$\text{H}_2(\text{g}) \rightarrow 2\text{H}(\text{g}) \quad \Delta H_3 = 330 \text{ kJ mol}^{-1}$$
 Take the bond energy of C—H bond equals to 350 kJ mol^{-1} .
 (a) 1165 kJ mol^{-1} (b) 837 kJ mol^{-1} (c) 865 kJ mol^{-1} (d) 815 kJ mol^{-1}
 - One mole of $\text{N}_2\text{O}_4(\text{g})$ at 300 K is kept in a closed container under one atmosphere. It is heated to 600 K when 20% by mass of $\text{N}_2\text{O}_4(\text{g})$ decomposes to $\text{NO}_2(\text{g})$. The resultant pressure is
 (a) 1.2 atm (b) 2.4 atm (c) 2.0 atm (d) 1.0 atm
 - Electrolysis of dilute aqueous NaCl solution was carried out by passing 10 milliamper current. The time required to liberate 0.01 mol of H_2 gas at the cathode is (1 Faraday constant = 96500 C mol^{-1})
 (a) $9.65 \times 10^4 \text{ s}$ (b) $19.3 \times 10^4 \text{ s}$ (c) $28.95 \times 10^4 \text{ s}$ (d) $38.6 \times 10^4 \text{ s}$

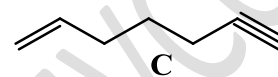
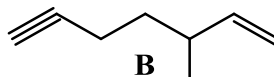
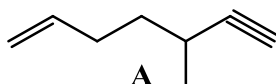
8. The standard reduction potentials of $\text{Cu}^{2+}|\text{Cu}$ and $\text{Cu}^{2+}|\text{Cu}^+$ are 0.337 V and 0.153 V, respectively. The standard electrode potential of $\text{Cu}^+|\text{Cu}$ half cell is
 (a) 0.184 V (b) 0.827 V (c) 0.521 V (d) 0.490 V
9. When 20 g of *naphthoic acid* ($\text{C}_{11}\text{H}_8\text{O}_2$) is dissolved in 50 g of benzene ($K_f = 1.72 \text{ K.kg.mol}^{-1}$), a freezing point depression of 2 K is observed. The van't Hoff factor (i) is
 (a) 0.5 (b) 1 (c) 2 (d) 3
10. Consider a reaction $aG + bH \rightarrow \text{Products}$. When concentration of both the reactants G and H is doubled, the rate increases by eight times. However, when concentration of G is doubled keeping the concentration of H fixed, the rate is doubled. The overall order of the reaction is
 (a) 0 (b) 1 (c) 2 (d) 3
11. The difference between heats of reaction at constant pressure and constant volume for the reaction $2 \text{C}_6\text{H}_6(l) + 15 \text{O}_2(g) \rightarrow 12 \text{CO}_2(g) + 6\text{H}_2\text{O}(l)$ at 25°C in kJ is
 (a) -7.43 (b) +3.72 (c) -3.72 (d) + 7.43
12. An equilibrium mixture for the reaction $2\text{H}_2\text{S}(g) \rightleftharpoons 2\text{H}_2(g) + \text{S}_2(g)$ had 1 mole of H_2S , 0.2 mole of H_2 and 0.8 mole of S_2 in a 2 litre flask. The value of K_c in mol.L^{-1} is
 (a) 0.08 (b) 0.016 (c) 0.004 (d) 0.160
13. The reaction for the decomposition of dinitrogen monoxide gas to form an oxygen radical is: $\text{N}_2\text{O}(g) \rightarrow \text{N}_2(g) + \text{O}(g)$. If the activation energy is 250 kJ per mole and the frequency factor is $8.0 \times 10^{11} \text{ s}^{-1}$, what is the rate constant for the first order reaction at 1000 K?
 (a) $7.0 \times 10^{-2} \text{ s}^{-1}$ (b) $3.7 \times 10^{-2} \text{ s}^{-1}$ (c) $0.71 \times 10^{-3} \text{ s}^{-1}$ (d) $9.7 \times 10^{-6} \text{ s}^{-1}$
14. A solid has a cubic cell with atoms A at the corners, atom B at each face centre and atom C at the body centre. The formula of the solid is
 (a) ABC (b) AB_3C (c) $\text{A}_3\text{B}_2\text{C}$ (d) $\text{A}_8\text{B}_6\text{C}$
15. Mole fraction of solute in benzene is 0.2, then the molality of the solution is
 (a) 2 (b) 4 (c) 3.2 (d) 3.8
16. Which of the following is true in respect of spontaneous adsorption of a gas on solid surface?
 (a) $\Delta G < 0$; $\Delta S > 0$; $\Delta H < 0$ (b) $\Delta G < 0$; $\Delta S < 0$; $\Delta H < 0$
 (c) $\Delta G > 0$; $\Delta S > 0$; $\Delta H < 0$ (d) $\Delta G < 0$; $\Delta S < 0$; $\Delta H > 0$
17. $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Cl}$ complexes can be chemically differentiated by using -
 (a) HNO_3 (b) NaOH (c) AgNO_3 (d) None of these
18. What is the primary valency of Cobalt in $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ complex?
 (a) 1 (b) 2 (c) 3 (d) None of these
19. $\text{K}_3[\text{CoF}_6]$ and $\text{K}_3[\text{Co}(\text{CN})_6]$ complexes are respectively
 (a) Paramagnetic and diamagnetic (b) Diamagnetic and paramagnetic (c) Paramagnetic and paramagnetic (d) Diamagnetic and diamagnetic
20. A radioactive sample has a half-life of 80 sec. How much time will it take to $7/8^{\text{th}}$ of the sample to decay?
 (a) 640 sec (b) 70 sec (c) 240 sec (d) 10 sec

21. In XeF_2 , XeF_4 , and XeF_6 , the number of lone pairs on Xenon atom is respectively
(a) 2, 3, 1 (b) 1, 3, 4 (c) 4, 1, 2 (d) 3, 2, 1
22. Which of the following statements is false?
(a) Radon is obtained from the decay of Radium.
(b) Xenon is most reactive among the rare gases.
(c) The most abundant noble gas found in the atmosphere is helium.
(d) Helium is the lightest noble gas.
23. The equivalent weight of KMnO_4 (M.W. = M) in basic medium is –
(a) M (b) M/2 (c) M/3 (d) M/5
24. The number of 3c-2e bond in $\text{Al}(\text{BH}_4)_3$ is –
(a) 0 (b) 3 (c) 5 (d) 6
25. Which statement is correct -
(a) As and Sb are metals
(b) As and Sb are non-metals
(c) As is a metal but have some non-metallic character whereas Sb is a non-metal but have some metallic character.
(d) As is a non-metal but have some metallic character whereas Sb is a metal but have some non-metallic character.
26. The system that contains maximum number of atoms is -
(a) 4.25 g of NH_3 (b) 8 g of O_2 (c) 2 g of H_2 (d) 4 g of He
27. The mole fraction of ethanol in water is 0.08. The *molality* of the solution is
(a) 6.32 (b) 4.83 (c) 3.82 (d) 2.84
28. Which of the following electronic configuration is not possible?
(a) $n = 3, l = 0, m = 0$ (b) $n = 3, l = 1, m = -1$ (c) $n = 2, l = 0, m = -1$ (d) $n = 2, l = 1, m = 0$
29. If the ionization energy for hydrogen atom is 13.6 eV, then the ionization energy for He^+ ion should be -
(a) 13.6 eV (b) 6.8 eV (c) 79 eV (d) 54.4 eV
30. The electronic configuration of the atom with electronic number 47 is-
(a) $[\text{Kr}]4d^{10}5s^2$ (b) $[\text{Kr}]4d^95s^2$ (c) $[\text{Kr}]4d^{10}5s^1$ (d) $[\text{Kr}]4d^{10}5s^15d^1$
31. The first ionization energy of Na, Mg, Al and Si are in the order -
(a) $\text{Na} < \text{Mg} > \text{Al} < \text{Si}$ (b) $\text{Na} > \text{Mg} < \text{Al} < \text{Si}$ (c) $\text{Na} > \text{Mg} > \text{Al} > \text{Si}$
(d) $\text{Na} > \text{Mg} > \text{Al} < \text{Si}$
32. Cinnabar is an ore of -
(a) Hg (b) Mg (c) Pb (d) Zn
33. Which statement is wrong about Mohr's salt?
(a) It is a double sulphate (b) It is diamagnetic in nature (c) It gives chemical tests for its constituent ions in aqueous solution (d) None of these

34. **A** is an orange coloured solid. When **A** is heated strongly in a dry test tube, it decomposes with evolution of a gas **B** and produces a solid **C**. The solid **C** when fused with solid KOH and solid KNO_3 over a mica foil, it produces a yellow solid mass **D**. Identify **A**, **B**, **C** and **D**.

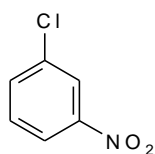
- (a) **A** = $\text{K}_2\text{Cr}_2\text{O}_7$, **B** = O_2 , **C** = Cr_2O_3 , **D** = CrO_3
 (b) **A** = $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$, **B** = N_2 , **C** = Cr_2O_3 , **D** = K_2CrO_4
 (c) **A** = $\text{K}_2\text{Cr}_2\text{O}_7$, **B** = O_2 , **C** = K_2O , **D** = K_2CrO_4
 (d) **A** = $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$, **B** = H_2O , **C** = K_2O , **D** = CrO_3

35. IUPAC nomenclature of the following compounds are

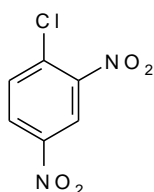


- (a) **A**: 3-methylhept-6-en-1-yne; **B**: 3-methylhept-1-en-6-yne; **C**: hept-1-en-6-yne
 (b) **A**: 5-methylhept-1-en-6-yne; **B**: 5-methylhept-6-en-1-yne; **C**: hept-6-en-1-yne
 (c) **A**: 5-methylhept-1-en-6-yne; **B**: 3-methylhept-1-en-6-yne; **C**: hept-1-en-6-yne
 (d) **A**: 3-methylhept-1-yn-6-ene; **B**: 5-methylhept-1-yn-6-ene; **C**: hept-6-yn-1-ene
36. The number of possible isomers with the molecular formula $\text{C}_3\text{H}_4\text{Cl}_2$ is
 (a) 7 (b) 10 (c) 11 (d) 12
37. The pair of electron in the given anion $\text{CH}_3\text{C}\equiv\text{C}^-$ is present in which orbitals?
 (a) sp^3 (b) sp^2 (c) sp (d) 2p
38. The correct order of decreasing acidic strength of trichloroacetic acid (**A**), trifluoroacetic acid (**B**), acetic acid (**C**) and formic acid (**D**) is.
 (a) $\text{D} > \text{B} > \text{A} > \text{C}$ (b) $\text{B} > \text{A} > \text{D} > \text{C}$ (c) $\text{B} > \text{D} > \text{A} > \text{C}$ (d) $\text{D} > \text{A} > \text{B} > \text{C}$
39. Out of the following four compounds which compounds can produce iodoform?
 (i) $\text{CH}_3\text{CONMe}_2$ (ii) I_2CHCOPh (iii) $\text{CH}_3\text{CH}_2\text{OH}$ (iv) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
 (a) (i) and (ii) (b) (ii) and (iii) (c) (ii) and (iv) (d) (i) and (iii)
40. In strong alkaline solution benzaldehyde is allowed to react with formaldehyde, and after acidification the products are-
 (a) PhCH_2OH , CH_3OH (b) PhCO_2H , CH_3OH (c) PhCH_2OH , HCO_2H (d) none of these
41. Which of the following observations are correct for aldehydes and ketones?
 (i) Both give DNP test (ii) Only ketones give DNP test (iii) Both give Tollen's test (iv) Only aldehydes give Tollen's test.
 (a) (i) and (iii) (b) (ii) and (iii) (c) (ii) and (iv) (d) (i) and (iv)
42. $\text{RCH}=\text{CH}_2$ can be converted to $\text{RCH}_2\text{CH}_2\text{OH}$ by-
 (a) i) H_2O_2 ii) OH^- (b) H_3O^+ (c) $\text{KMnO}_4 / \text{OH}^-$ (d) i) B_2H_6 ii) $\text{H}_2\text{O}_2 / \text{OH}^-$

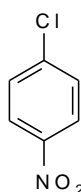
43. Among the compounds below



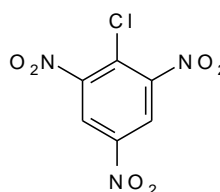
(1)



(2)



(3)



(4)

the correct order of reactivity towards NaOMe is:

(a) $1 < 2 < 3 < 4$ (b) $1 < 3 < 2 < 4$ (c) $3 < 1 < 4 < 2$ and (d) $4 < 2 < 3 < 1$

44. Which of the following reaction is not suitable for the synthesis of anisole?

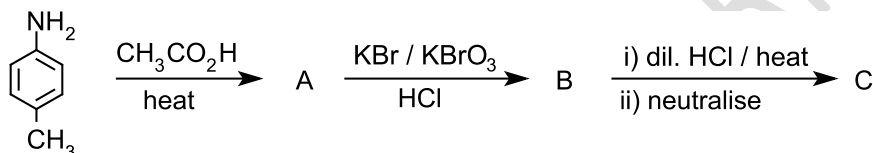
(a) Phenol + CH_3I + K_2CO_3 in acetone \longrightarrow

(b) Phenol + CH_3I \longrightarrow

(c) Phenol + CH_2N_2 in ether \longrightarrow

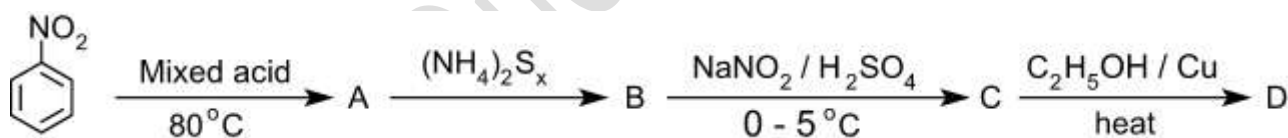
(d) Phenol + $(\text{CH}_3)_2\text{SO}_4$ + NaOH \longrightarrow

45. Identify compound C in the following sequence of reactions.



(a) 2, 6 – dibromo – 4 – methylaniline (b) 3 – bromo – 4 – methylaniline (c) 2 – bromo – 4 – methylaniline (d) 3, 5 – dibromo – 4 – methylaniline

46. Identify compound D in the following sequence of reactions.



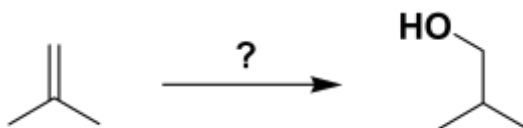
(a) *m* – nitrophenol (b) nitrobenzene (c) *m* – aminophenol (d) *m* – nitrophenetole

47. The aldehyde which will form Grignard addition product with one equivalent of Grignard reagent is: (a) Salisaldehyde (b) Benzaldehyde (c) 4-carboxybenzaldehyde (d) 4-(hydroxymethyl) benzaldehyde

48. One mole of alkene on ozonolysis gives two moles of butanone. The alkene is

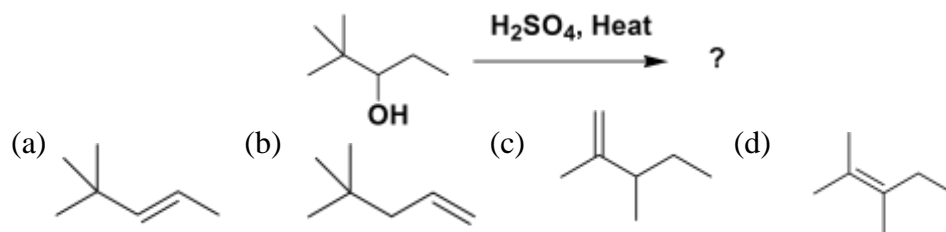
(a) 3,4-Dimethyl-hex-3-ene (b) 3,4-Dimethyl-hex-2-ene (c) 2,3-Dimethyl-hex-2-ene (d) 2,5-Dimethyl-hex-3-ene

49. For following transformation, the suitable reagent is:



(a) H_2O , H^+ (b) NaBH_4 (c) BH_3 ; NaOH, H_2O_2 (d) $\text{Hg}(\text{OAc})_2$, H_2O ; NaBH_4

50. Identify the major product for following reaction:



Sample Question_RKMVCC