Date : 13-06-2017   **Full Marks : 50**   Time: 11·00 a.m – 12·00 noon

Instructions for the candidate

Answer all the questions given below. Each question carries 2 marks. Tick (✓) the correct option. The tick must be very clear — if it is smudgy or not clear, no marks will be awarded.
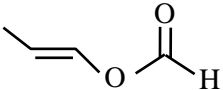
Name of the student : _____

Application No. : _____

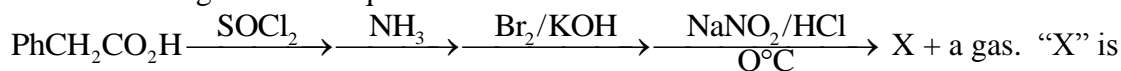Signature of the student : _____   Signature of the Invigilator : _____

1. An organic compound "X" when treated with aqueous ethanolic $AgNO_3$ forms white precipitate. "X" can be

   a) $CH_2 = CH - Cl$
   b) Cl
   c) $CH_3 -$ $- Cl$
   d) Cl, CH_3

2. $\xrightarrow{H_3O^+} A + B$. Compound A and B can not be differentiated by

   a) DNP
   b) Tollen's Reagent
   c) NH_2OH
   d) $NaHCO_3$

3. In the following reaction sequence
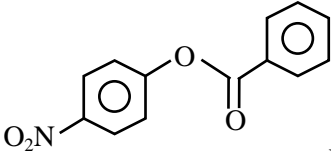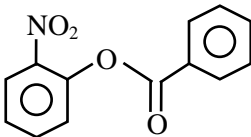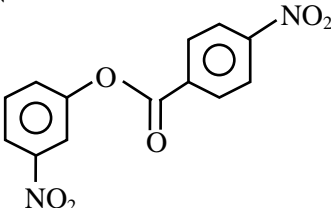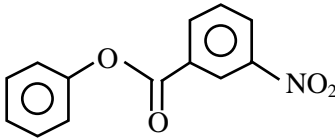 $$PhCH_2CO_2H \xrightarrow{SOCl_2} \xrightarrow{NH_3} \xrightarrow{Br_2/KOH} \xrightarrow[O°C]{NaNO_2/HCl} X + a\ gas.$$ "X" is

   a) $PhCH_2CONH_2$
   b) $PhCH_2OH$
   c) $PhCH_2CH_2OH$
   d) $PhOH$
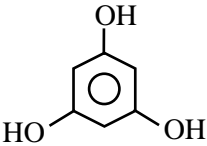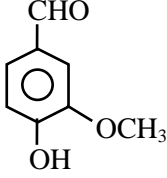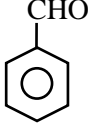
4. The maximum number of carbon atoms and hydrogen atoms that could be coplanar in $Ph(CH_3)C = CH_2$ is respectively :
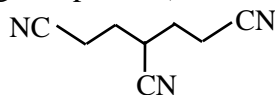
   a) 8, 9
   b) 9, 10
   c) 8, 10
   d) 9, 8

5. Nitration of PhOCOPh mainly gives

   a)
   b)
   c)
   d)

6. Which of the following compounds will not react with NH_2OH

   a)
   b)
   c)
   d)
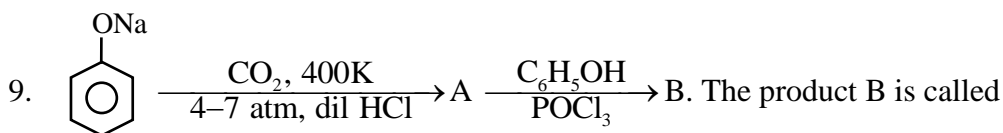
(1)

7. The parent chain in the following compound (in IUPAC) naming contains how many carbon atoms?

$$NC\diagdown\diagup\diagdown\diagup^{CN}$$
$$CN$$

   a) 5   b) 7   c) 8   d) none of these

8. The number of chiral carbon atoms in β –D–glucopyranose is

   a) 5   b) 6   c) 4   d) 3

9. $\underset{}{\overset{ONa}{\bigcirc}}$ $\xrightarrow[\text{4–7 atm, dil HCl}]{\text{CO}_2,\ 400\text{K}}$ A $\xrightarrow[\text{POCl}_3]{\text{C}_6\text{H}_5\text{OH}}$ B. The product B is called

   a) Salol   b) Aspirin   c) Oil of winter green   d) Methyl Salicylate

10. Which of the following set of quantum number is not permitted?

   a) $n = 2,\ \ell = 1,\ m = -1,\ s = -\dfrac{1}{2}$ b) $n = 2,\ \ell = 0,\ m = 0,\ s = +\dfrac{1}{2}$

   c) $n = 2,\ \ell = 2,\ m = -1,\ s = +\dfrac{1}{2}$ d) $n = 2,\ \ell = 1,\ m = +1,\ s = +\dfrac{1}{2}$

11. Oxidation number of sulphur in H_2SO_5 is—

   a) +3   b) +8   c) +6   d) none of these

12. Sodium nitroprusside gives violate colour with sulphide ions, the formula of the violate coloured compound is—

   a) $Na_2[Fe(NO)(CNS)_5]$ b) $H_3[Fe(NOS)(CN)_5]$ c) $Na_4[Fe(NOS)(CN)_5]$ d) none of these

13. $BaSO_4$ is insoluble in water, because
   a) $BaSO_4$ is covalent   b) Lattice energy of $BaSO_4$ < Hydration energy
   c) Hydration energy < Lattice energy of $BaSO_4$ d) Complex structure of $BaSO_4$

14. Shape of $XeOF_4$ is—
   a) Octahedral   b) Pyranidal   c) T-shaped   d) square pyranidal

15. Identify the correct order of acidic strength of CO_2, CuO, CaO, H_2O
   a) $H_2O < CO_2 < CaO < CuO$ b) $CaO < H_2O < CuO < CO_2$
   c) $CuO < CaO < H_2O < CO_2$ d) $CaO < CuO < H_2O < CO_2$

16. The stability order of the pentoxide, P_2O_5, As_2O_5, N_2O_5, Sb_2O_5 is
   a) $As_2O_5 < N_2O_5 < Sb_2O_5 < P_2O_5$ b) $As_2O_5 < Sb_2O_5 < P_2O_5 < N_2O_5$
   c) $N_2O_5 < P_2O_5 < As_2O_5 < Sb_2O_5$ d) $N_2O_5 < Sb_2O_5 < As_2O_5 < P_2O_5$

17. The correct order of ionic mobility/conductivity of alkali metal ions in H_2O is—
   a) $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$ b) $Na^+ > Li^+ > K^+ > Rb^+ > Cs^+$
   c) $Li^+ > K^+ > Na^+ > Rb^+ > Cs^+$ d) $Cs^+ > Rb^+ > K^+ > Na^+ > Li^+$

18. Given a function $F(x) = x^2 e^{-x^2}$, which of the following curves describe the nature of this $F(x)$,

a)   b)   c)   d)
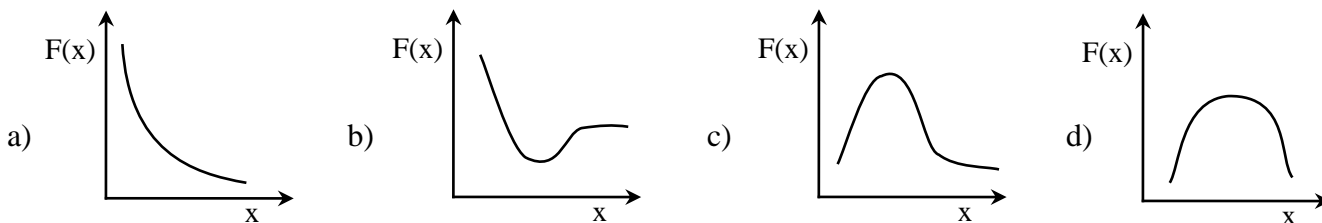
19. The complete electrolysis of 1mol of water requires the following amount of electric charge (F is the Faraday constant)

    a) F   b) 1·5F   c) 2F   d) 3F

20. Which of the following relations correctly define the first law of thermodynamics

    a) $E = Q + W$ and $w = -Pdv$

    b) $E = \Delta Q + \Delta W$ and $\Delta w = Pdv$

    c) $\Delta E = Q + W$ and $w = -Pdv$

    d) $\Delta E = \Delta Q + \Delta W$ and $\Delta w = -Pdv$

21. How many cm^3 of 1·0 M NaOH solution must be added to 100·0 cm^3 of 0·1 M H_3PO_4 solution to obtain a phosphate buffer solution with pH of about 7·2?

    (The pK_a values for H_3PO_4 are $pK_1 = 2·1$, $pK_2 = 7·2$, $pK_3 = 12·0$)

    a) 5·0 cm^3 b) 10·0 cm^3 c) 15·0 mL   d) 20·0 mL

22. The following equilibrium is being reached starting with pure A, B at a temperature T.

    $A + B \rightleftharpoons C + D + \Delta$ (4 calory) If the same reaction were carried out at a higher temperature

    a) The percentage of C, D in the equilibrium mixture increases, while the time taken by the system to reach the equilibrium decreases

    b) The percentage of C, D in the equilibrium mixture decreases while the time taken by the system to reach the equilibrium also decreases

    c) The percentage of C, D in the equilibrium mixture decreases, while the time taken by the system to reach the equilibrium increases

    d) The percentage of C, D in the equilibrium mixture as well as the time taken by the system to reach the equilibrium increases

23. Which of the following statements is INCORRECT?

    a) Viscosity of both liquid and gas increase with increase of temperature

    b) Viscosity of liquid decreases while that of the gas increases with increase of temperature

    c) Viscosity of liquid increases while that of the gas decreases with increase of temperature

    d) cannot be said

24. The work done in an adiabatic process where the temperature of one mole of an ideal gas changes from 100°C to 200°C is (take $C_V = 12·5$ JK^{-1}mol^{-1})

    a) 31·2 J   b) 1250 J   c) 1·250 J   d) 243 J

25. The molar mass of glucose ($C_6H_{12}O_6$) is 180 g mol^{-1} and N_A is the Avogadro constant. Which one of the following statement is not correct?

    a) 1·0 m mol amount of glucose has a mass of 180 mg

    b) 100 cm^3 of a 0·1 M solution contain 18 g of glucose

    c) 0·01 mol of glucose comprises of 0·01×24×N_A atoms

    d) An aqueous 0·5 M solution of glucose is prepared by dissolving 90 g of glucose to give 1000 cm^3 of solution

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