FINAL JEE–MAIN EXAMINATION – JULY, 2021

(Held On Tuesday 27th July, 2021)　　　　**TIME : 3 : 00 PM to 6 : 00 PM**
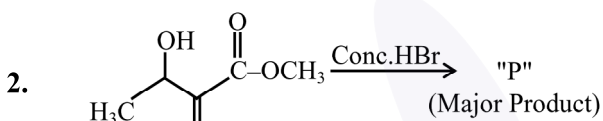
| CHEMISTRY	TEST PAPER WITH ANSWER

SECTION-A

1. Which one of the following set of elements can be detected using sodium fusion extract ?

(1) Sulfur, Nitrogen, Phosphorous, Halogens

(2) Phosphorous, Oxygen, Nitrogen, Halogens

(3) Nitrogen, Phosphorous, Carbon, Sulfur

(4) Halogens, Nitrogen, Oxygen, Sulfur

Official Ans. by NTA (1)

2.

Consider the above reaction, the major product "P" formed is :-
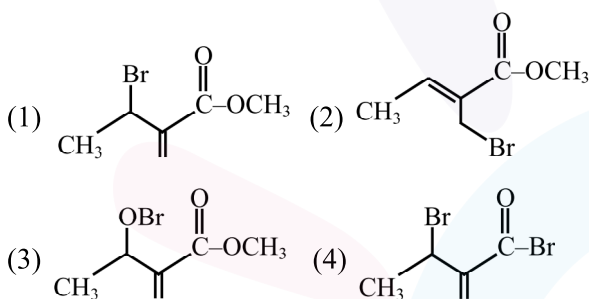
Official Ans. by NTA (2)

3. The number of neutrons and electrons, respectively, present in the radioactive isotope of hydrogen is :-

(1) 1 and 1　　　　　(2) 3 and 1

(3) 2 and 1　　　　　(4) 2 and 2

Official Ans. by NTA (3)

4. Match List - I with List II :

List - I		List - II	
(a)	Li	(i)	photoelectric cell
(b)	Na	(ii)	absorbent of CO_2
(c)	K	(iii)	coolant in fast breeder nuclear reactor
(d)	Cs	(iv)	treatment of cancer
		(v)	bearings for motor engines

Choose the **correct** answer from the options given below :

(1) (a) - (v), (b) - (i), (c) - (ii), (d) - (iv)

(2) (a) - (v), (b) - (ii), (c) - (iv), (d) - (i)

(3) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(4) (a) - (v), (b) - (iii), (c) - (ii), (d) - (i)

Official Ans. by NTA (4)

5. Given below are two statement : one is labelled as **Assertion A** and the other is labelled as **Reason R.**

Assertion A : $SO_2(g)$ is adsorbed to a large extent than $H_2(g)$ on activated charcoal.

Reason R : $SO_2(g)$ has a higher critical temperature than $H_2(g)$.

In the light of the above statements, choose the most appropriate answer from the options given below.

(1) Both **A** and **R** are correct but **R** is not the correct explanation fo **A**

(2) Both **A** and **R** are correct and **R** is the correct explanation of **A**.

(3) **A** is not correct but **R** is correct.

(4) **A** is correct but **R** is not correct.

Official Ans. by NTA (2)

6. The **CORRECT** order of first ionisation enthalpy is :

(1) Mg < S < Al < P　　　(2) Mg < Al < S < P

(3) Al < Mg < S < P　　　(4) Mg < Al < P < S

Official Ans. by NTA (3)

7. Given below are two statements :

Statement I : Hyperconjugation is a permanent effect.

Statement II : Hyperconjugation in ethyl cation $\left(CH_3 - \overset{+}{C}H_2 \right)$ involves the overlapping of $C_{sp^2} - H_{1s}$ bond with empty 2p orbital of other carbon.

Choose the **correct** option :

(1) Both **statement I** and **statement II** are false

(2) **Statement I** is incorrect but **statement II** is true

(3) **Statement I** is correct but **statement II** is false

(4) Both **Statement I** and **statement II** are true.

Official Ans. by NTA (3)

8. Given below are two **statements** :

Statement **I** : $[Mn(CN)_6]^{3-}$, $[Fe(CN)_6]^{3-}$ and $[Co(C_2O_4)_3]^{3-}$ are d^2sp^3 hybridised.

Statement **II** : $[MnCl_6]^{3-}$ and $[FeF_6]^{3-}$ are paramagnetic and have 4 and 5 unpaired electrons, respectively.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) **Statement I** is correct but **statement II** is false

(2) Both **statement I** and **statement II** are false

(3) **Statement I** is incorrect but **statement II** is true

(4) Both **statement I** and **statement II** are are true

Official Ans. by NTA (4)

9. To an aqueous solution containing ions such as Al^{3+}, Zn^{2+}, Ca^{2+}, Fe^{3+}, Ni^{2+}, Ba^{2+} and Cu^{2+} was added conc. HCl, followed by H_2S.
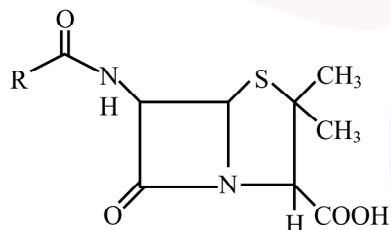
The total number of cations precipitated during this reaction is/are :

(1) 1   (2) 3   (3) 4   (4) 2

Official Ans. by NTA (1)

10. Given below are two **statements** :

Statement **I** : Penicillin is a bacteriostatic type antibiotic.

Statement **II** : The general structure of Penicillin is :
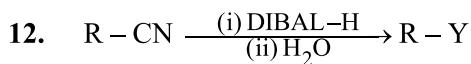

Choose the correct option :

(1) Both **statement I** and **statement II** are false

(2) **Statement I** is incorrect but **statement II** is true

(3) Both **statement I** and **statement II** are true

(4) **Statement I** is correct but **statement II** is false

Official Ans. by NTA (2)

11. Compound **A** gives D-Galactose and D-Glucose on hydrolysis. The compound **A** is :

(1) Amylose   (2) Sucrose

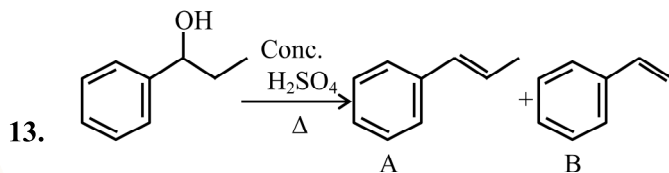(3) Maltose   (4) Lactose

Official Ans. by NTA (4)

12. $R - CN \xrightarrow[\text{(ii) } H_2O]{\text{(i) DIBAL}-H} R - Y$

Consider the above reaction and identify "Y"

(1) $-CH_2NH_2$ (2) $-CONH_2$

(3) $-CHO$ (4) $-COOH$

Official Ans. by NTA (3)

13.

consider the above reaction, and choose the correct statement :

(1) The reaction is not possible in acidic medium

(2) Both compounds **A** and **B** are formed equally

(3) Compound **A** will be the major product

(4) Compound **B** will be the major product

Official Ans. by NTA (3)

14. Match List - I with List - II :

	List - I (compound)		List - II (effect/affected species)
(a)	Carbon monoxide	(i)	Carcinogenic
(b)	Sulphur dioxide	(ii)	Metabolized by pyrus plants
(c)	Polychlorinated biphenyls	(iii)	Haemoglobin
(d)	Oxides of Nitrogen	(iv)	Stiffness of flower buds

Choose the **correct** answer from the options given below :

(1) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

(2) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

(3) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

(4) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

Official Ans. by NTA (1)

15. If the Thompson model of the atom was correct, then the result of Rutherford's gold foil experiment would have been :

(1) All of the α-particles pass through the gold foil without decrease in speed.

(2) α-Particles are deflected over a wide range of angles.

(3) All α-particles get bounced back by 180°

(4) α-Particles pass through the gold foil deflected by small angles and with reduced speed.

Official Ans. by NTA (4)

16. Number of Cl = O bonds in chlorous acid, chloric acid and perchloric acid respectively are :

(1) 3, 1 and 1   (2) 4, 1 and 0

(3) 1, 1 and 3   (4) 1, 2 and 3

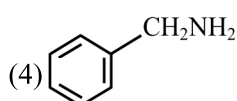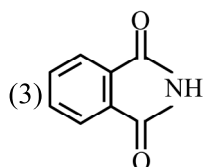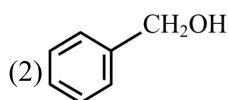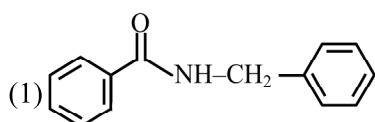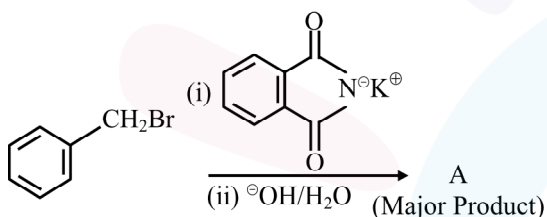**Official Ans. by NTA (3)**

17. Select the correct statements.

(A) Crystalline solids have long range order.

(B) Crystalline solids are isotropic.

(C) Amorphous solid are sometimes called pseudo solids.

(D) Amorphous solids soften over a range of temperatures.

(E) Amorphous solids have a definite heat of fusion.

Choose the most appropriate answer from the options given below.

(1) (A), (B), (E) only

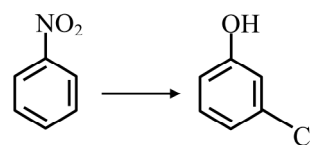(2) (B), (D) only

(3) (C), (D) only

(4) (A), (C), (D) only

Official Ans. by NTA (4)

18. What is A in the following reaction ?

(1)

(2)

(3)

(4)

Official Ans. by NTA (4)

19. The correct sequence of correct reagents for the following transformation is :-

(1) (i) Fe, HCl   (ii) Cl_2, HCl,

(iii) $NaNO_2$, HCl, 0°C   (iv) H_2O/H^+

(2) (i) Fe, HCl   (ii) $NaNO_2$, HCl, 0°C

(iii) H_2O/H^+ (iv) Cl_2, $FeCl_3$

(3) (i) Cl_2, $FeCl_3$ (ii) Fe, HCl

(iii) $NaNO_2$, HCl, 0°C   (iv) H_2O/H^+

(4) (i) Cl_2, $FeCl_3$ (ii) $NaNO_2$, HCl, 0°C

(iii) Fe, HCl   (iv) H_2O/H^+
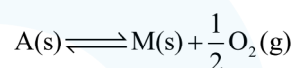
Official Ans. by NTA (3)

20. The addition of silica during the extraction of copper from its sulphide ore :-

(1) converts copper sulphide into copper silicate

(2) converts iron oxide into iron silicate

(3) reduces copper sulphide into metallic copper

(4) reduces the melting point of the reaction mixture

Official Ans. by NTA (2)

SECTION-B

1. The equilibrium constant for the reaction

$$A(s) \rightleftharpoons M(s) + \frac{1}{2}O_2(g)$$

is K_p = 4. At equilibrium, the partial pressure of O_2 is ____ atm. (Round off to the nearest integer)

Official Ans. by NTA (16)

2. When 400 mL of 0.2M H_2SO_4 solution is mixed with 600 mL of 0.1 M NaOH solution, the increase in temperature of the final solution is ____ × 10^{-2} K. (Round off to the nearest integer).

[Use : H^+ (aq) + OH^-(aq) → H_2O :

$\Delta_\gamma H = -57.1$ kJ mol^{-1}]

Specific heat of H_2O = 4.18 J K^{-1} g^{-1}

density of H_2O = 1.0 g cm^{-3}

Assume no change in volume of solution on mixing.

Official Ans. by NTA (2)

ALLEN Ans. (82)

3. $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$
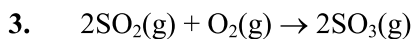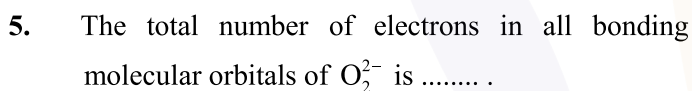
The above reaction is carried out in a vessel starting with partial pressure $P_{SO_2} = 250 \, m \, bar$, $P_{O_2} = 750 m$ bar and $P_{SO_3} = 0 \, bar$. When the reaction is complete, the total pressure in the reaction vessel is _____ m bar. (Round off of the nearest integer).
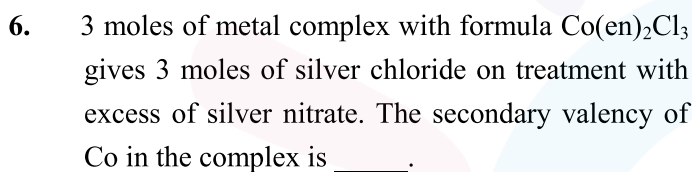
Official Ans. by NTA (875)

4. 10.0 mL of 0.05 M $KMnO_4$ solution was consumed in a titration with 10.0 mL of given oxalic acid dihydrate solution. The strength of given oxalic acid solution is .... $\times 10^{-2}$ g/L.

(Round off to the nearest integer)

Official Ans. by NTA (1575)

5. The total number of electrons in all bonding molecular orbitals of O_2^{2-} is ....

(Round off to the nearest integer)

Official Ans. by NTA (10)

6. 3 moles of metal complex with formula $Co(en)_2Cl_3$ gives 3 moles of silver chloride on treatment with excess of silver nitrate. The secondary valency of Co in the complex is _____.

(Round off to the nearest integer)

Official Ans. by NTA (6)

7. In a solvent 50% of an acid HA dimerizes and the rest dissociates. The van't Hoff factor of the acid is _____ $\times 10^{-2}$.

(Round off to the nearest integer)

Official Ans. by NTA (125)

8. The dihedral angle in staggered form of Newman projection of 1, 1, 1-Trichloro ethane is .... degree. (Round off to the nearest integer)

(Round off to the nearest integer)

Official Ans. by NTA (60)

9. For the first order reaction A $\rightarrow$ 2B, 1 mole of reactant A gives 0.2 moles of B after 100 minutes. The half life of the reaction is ...... min. (Round off to the nearest integer).
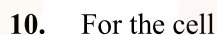
[Use : ln 2 = 0.69, ln 10 = 2.3

Properties of logarithms : $\ln x^y = y \ln x$;

$$\ln\left(\frac{x}{y}\right) = \ln x - \ln y]$$
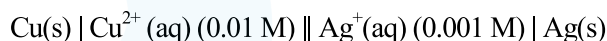
(Round off to the nearest integer)

Official Ans. by NTA (300)
ALLEN Ans. (600 to 700)

10. For the cell

$Cu(s) \,|\, Cu^{2+}(aq) \,(0.1M) \,\|\, Ag^+ \,(aq) \,(0.01M) \,|\, Ag(s)$

the cell potential $E_1 = 0.3095$ V

For the cell

$Cu(s) \,|\, Cu^{2+} \,(aq) \,(0.01 \, M) \,\|\, Ag^+(aq) \,(0.001 \, M) \,|\, Ag(s)$

the cell potential = _____ $\times 10^{-2}$ V. (Round off the Nearest Integer).

$\left[\text{Use} : \dfrac{2.303 \, RT}{F} = 0.059 \right]$

Official Ans. by NTA (28)