JEE-ADVANCED-2013-P1-Model

Time:09:00 A.M to 12:00 Noon **IMPORTANT INSTRUCTIONS** **Max Marks: 180**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 11 – 15)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 16 – 20)	Questions with Integer Answer Type	4	-1	5	20
Total				**20**	**60**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 30)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 31 – 35)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 36 – 40)	Questions with Integer Answer Type	4	-1	5	20
Total				**20**	**60**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 51 – 55)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 56 – 60)	Questions with Integer Answer Type	4	-1	5	20
Total				**20**	**60**

CHEMISTRY: **Max.Marks : 60**

SECTION I

Single Correct Answer Type

This section contains **10 multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

21. Which of the following provide the path towards quantum mechanical approach towards structure of atom?
A) Black body radiation B) Photo electric effect
C) Quantum theory D) Uncertainity principle

22. The electrons constructive wave has a DeBroglie's wave length of $3.3A^0$ in ground state H – atom. What could be the approximate percentage uncertainity in the velocity if the uncertainity in the position is maximum? (Radius of Bohr's orbit = $0.53n^2A^0$) $\left[\Delta x.\Delta p \geq \frac{h}{4\pi}\right]$

A) $\frac{25}{\pi}$ B) $\frac{50}{\pi}$ C) $\frac{75}{\pi}$ D) $\frac{100}{\pi}$

23. What could be the maximum distance between two successive orbits in Bohr's atom with principal quantum numbers n_1 *and* n_2 respectively? $\left(r_0 = 0.53n^2A^0\right)$

A) $0.53\left(n_1+n_2\right)A^0$ B) $0.53\left(n_2-n_1\right)A^0$

C) $0.53\left(n_2^{\,2}+n_1^{\,2}\right)A^0$ D) $0.53\left(n_1.n_2\right)A^0$

24. 12 grams of an impure sample of $CaCO_3$ on strong heating produced 7.6gms of residue. What is the percentage of impurities in the given sample?
A) 16.6% B) 20% C) 30% D) 25%

25. Which statement is true?
A) A lyophobic 'sol' is less viscous than its dispersion medium.
B) Tyndal effect is more significant in lyophobic "sol"s than in lyophilic 'sol's.
C) Discharging 'sol' particles at electrodes is called dialysis
D) Milk is an aqua sol

26. In which reaction electron transfer takes place?
A) $2KHSO_4 + F_2 \rightarrow K_2S_2O_8 + 2HF$
B) $Cr_2O_7^{-2} + 4H_2O_2 + 2H^+ \rightarrow 2CrO_5 + 5H_2O$
C) $2KCN + 2H_2SO_4 + 4H_2O \rightarrow 2HCOOK + (NH_4)_2\,SO_4 + K_2SO_4$
D) $Ni + 4CO \rightarrow Ni(CO)_4$

27. Which statement is NOT a correct statement?
A) Cleaning action of soap involves emulsification
B) Action of H_2S on As_2O_3 in aqueous medium forms a negative sol
C) Peptisation process reverts a precipitate into collidal 'sol'
D) Gold 'sol' is protected by addition of concentrated NaCl solution

28. In which of the following conversions the equivalent weight of the reactant is twice that of its

respective molecular weight or ionic weight?

A) H_2O_2 into H_2O and O_2 B) ClO_3^- into Cl^- and O_2

C) Cu^+ ions into 'Cu' and 'Cu^{+2}' D) NH_4NO_3 into N_2O

29. During disproportionation of a neutral substance 'X_2', if 60% is oxidised into '+2' state, what is the oxidation state of 'X' in the reduced form?

A) – 4 B) – 3 C) – 1 D) – 2.5

30. One litre of 1M H_2O_2 solution is prepared and left open to air. After 10 hours of time 20ml of this solution could decolourise 20ml of 0.32M $KMnO_4$ acidified by equal volume of 0.5M H_2SO_4. How many grams of O_2 escaped into air from the given solution before titration?

A) 1.6gms B) 3.2gms C) 6.4gms D) 0.8gms

SECTION II
Multiple Correct Answer(s) Type

This section contains **5 multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE are correct.**

31. Which statement(s) is (are) correct as per Bohr's atom?($IP = 13.6\, ev/atom$)

A) the ratio of wave numbers of least energetic Lyman and most energetic Balmer lines is 3 : 1 in H – spectrum

B) If the velocity of the electron is suddenly increased by $\sqrt{2}$ times, the electron is knocked out of atom.

C) Angular momentum of electron in first orbit is same as that in '1s' orbital (wave mechanical approach)

D) An electron can have an acceptable kinetic energy 1.36ev/atom.

32. The complete wave function of a quntum state in H – atom is given by (a = Bohr's radius) $\psi = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a}\right)^{\frac{3}{2}}\left(2-\frac{r}{a}\right)e^{-r/2a}$ Which statement(s) is(are) true about this orbital?

A) This orbital is independent on angular parametres

B) The wave function can take – ve values only at distances greater than '2a'

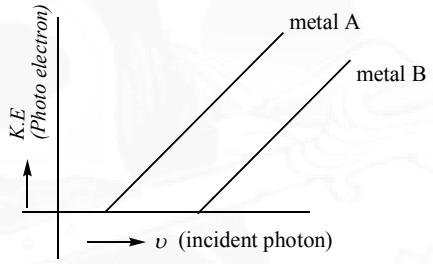
C) The orbital angular momentum of the state is zero

D) The orbital can have two radial nodes.

33. From which energy state(s) maximum energy would be required to knock out electron?
A) '4s' of H – atom B) '3d' of H – atom
C) '4s' of He^+ ion D) '3d' of He^+ ion

34. 'Mg' metal reduces dilute HNO_3 into NH_4^+ ions and gets oxidised to Mg^{+2} in aqueous medium. Which statement(s) is(are) correct?
A) One mole of 'Mg' can reduce 2.5 moles of HNO_3
B) Only 10% of the used up HNO_3 is subjected to reduction
C) 10% of the HNO_3 used up is left unreduced
D) One mole HNO_3 could be reduced by 4 moles of Mg

35.



The above graph describes photo electric effect from two metals. Which statement is wrong?
A) Slopes of both lines are same
B) 'A' is a better photo electric metal than 'B'
C) 'A' ejects more photo electrons than 'B' when irradiated with identical photons.
D) Work function of 'A' is less than that of 'B'

SECTION III
Integer Answer Type

This section contains **5 questions.** The answer to each question is single digit integer, ranging from 0 to 9 (*both inclusive*).

36. In two hydrogen atoms electrons are excited into 3rd excited states. While droping to ground state, what is the maximum possible number of spectral lines formed in the emission spectrum?

37. What is the ratio of degeneracies of second excited states of "He^+" ion and "H^-" ion?

38. Concentration of uniform "micelle" particles at CMC of a surfactant solution is 0.004M. Charge carried by each micelle is 4×10^{-17} Colombs. What is the molar concentration of the surfactant $\left(Na^+X^-\right)$ at CMC? (charge electron $1.6\times10^{-19}C$, degree of association = 1)

39. How much potential (volts) is to be applied to prevent ejection of photo electron from a metal (work function = 5ev) irradiated with a photon of 10ev energy?

40. What is the equivalent weight of H_2 during action of NaH with H_2O?