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Name of Examination (Please tick, symbol is given)	:	MID		END	✓	SUPPLE	
Name of the School (Please tick, symbol is given)	:	SOE	✓	SOCS		SOP	
Programme	:	B.Sc (H) Physics/Math					
Semester	:	IV					
Name of the Course	:	Chemistry of s and p block elements, states of matter and chemical kinetics.					
Course Code	:	CHEM 1010					
Name of Question Paper Setter	:	Dr. Sanjeev Kumar/Dr. Sapna Jain					
Employee Code	:	40000541/ 40001331					
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Note: Please mention additional Stationery to be provided, during examination such as Table/Graph Sheet etc. else mention "NOT APPLICABLE":

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Date of Examination	:	
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UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, July 2020

Course: B.Sc (H) Physics/Mathematics
Semester: IV

Program: Chemistry of s and p block elements, states of matter and chemical kinetics.
Course Code: CHEM 1010   **Max. Marks: 40**

Instructions: Read the instructions given below carefully:
1. All questions are compulsory.
2. Write all the answers in white A4 sheet
3. Mention your Name, Roll No and SAP ID on top of your answer sheet. At the end of answer sheet put your signature.
4. Upload answers in a single pdf file on the blackboard.

PART A

1)   Which of the following contains P - O - P bond?
   a) Hypophosphorous acid
   b) Phosphorous acid
   c) Pyrophosphoric acid
   d) Orthophosphoric acid

2)   Which of the following are examples of surface tension
   a) Insects walking on water
   b) Floating a needle on the surface of the water.
   c) Rainproof tent materials where the surface tension of water will bridge the pores in the tent material
   d) Clinical test for jaundice

3)   Which one of the following arrangement does not give the correct picture of the trends indicated against it?
   a) $F_2 > Cl_2 > Br_2 > I_2$: Electron gain enthalpy
   b) $F_2 > Cl_2 > Br_2 > I_2$: Bond dissociation energy
   c) $F_2 > Cl_2 > Br_2 > I_2$: Electronegativity

d) $F_2 > Cl_2 > Br_2 > I_2$: Oxidizing power

4) Choose all correct statement

Hydrazine is a molecule of two singly-bonded nitrogen atoms and four peripheral hydrogen atoms.

Hydroxylamine is an inorganic compound with the formula NH_4OH.

Hydrazoic acid, also known as hydrogen azide

Ammonia is a strong base.

5) Diborane is characterized by
a) 2 electrons , 3 atoms bond
b) 3 electrons, 2 atoms bond
c) 2 electrons, 2 atoms bond
d) 3 electrons, 3 atoms bond

6) The following are electronegativity scales
a) Pauling, Mulliken, and Alter-Rochow scales
b) Alfred-Rochow , Pauling, and van arkel
c) Van arkel, Pauling and mulliken
d) Mulliken, Pauling and Alfre-Rochow

7) Which of the following has – O – O – linkage
a) H2S2O6
b) H2S2O8
c) H2S3O3
d) All

8) Which one of the following arrangements represents the correct order of least negative to most negative electron gain enthalpy for C, Ca, Al, F and O?
a) $Ca < Al < C < O < F$
b) $Al < Ca < O < C < F$
c) $Al < O < C < Ca < f$
d) $C < F < O < Al < Ca$

9) In froth floatation process for the purification of ores, the particles of ore float because
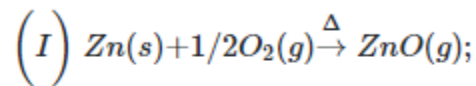a) They are insoluble
b) They bear electrostatic charge
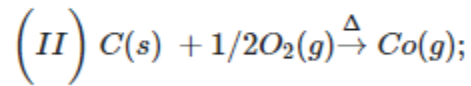c) Their surface is not easily wetted by water
d) They are light

10)

Consider the following reactions at $1000°C$.

$$\left(\text{I}\right) \; Zn(s)+1/2O_2(g)\xrightarrow{\Delta} ZnO(g);$$

$$\Delta G° = -360 \; kJ \; mol^{-1}$$

$$\left(\text{II}\right) \; C(s) +1/2O_2(g)\xrightarrow{\Delta} Co(g);$$

$$\Delta G° = -460 \; kJ \; mol^{-1}$$

and choose the correct statement at $1000°C$.

a)   ZnO is more stable than CO
b)   ZnO can be reduced by C
c)   ZnO and CO are formed at equal rate
d)   ZnO cannot be reduced to Zn by C.

11)

Which method of purification is represented by the equation? $Ti + 2I_2 \xrightarrow{\text{500K}} TiI_4 \xrightarrow{\text{1675K}} Ti + 2I_2 \Big|$
 Impure $\phantom{xrightarrow{500K} TiI_4 xrightarrow{1675K}}$ Pure

a)   Cupellation
b)   Poling
c)   Van Arkel
d)   Zone refining
12)   Which of these ratios gives the value of viscosity of fluid?

a) Ratio of the shearing stress to the weight of the fluid

b) Ratio of the shearing stress to the density of the fluid

c) Ratio of the velocity gradient and shearing stress

d) The ratio of the shearing stress to the velocity gradient

13) If the surface of a liquid is plane, then the angle of contact of the liquid with the walls of the container is

   a) Acute angle
   b) Obtuse angle
   c) 90^0
   d) 0^0
14)   At the critical temperature, the surface tension of the liquid

a)Is zero

b)   Is infinity
c)   Is the same as that at the other temperature
d)   Cannot be determined
15)   At critical pt. in andrew's isotherm:
   a) Liquid vapor coexist
   b) Substances may change from liquid to gas phase
   c) Substances may change gas to liquid phase
   d) Both states almost become indistinghishable

16) In a reaction A→B, the rate of reaction increases two times on increasing the concentration of the reactant four times, then order of reaction is

   a) 0

   b) 2

   c) ½

   d) 4

17). The rate constant is given by the equation $k = p.Z\, e^{-E/RT}$, which factor should register a decrease for the reaction to proceed more rapidly?

         a) T   b) Z   c) E   d) p

18) . For the reaction $N_2 + 3H_2 \rightarrow 2NH_3$ if $\Delta[NH_3]/\Delta t = 2 \times 10^{-4}$ mole $L^{-1} s^{-1}$ the value of $-\Delta[H_2]/\Delta t$ would be

         a) 1×10^{-4} mole $L^{-1} s^{-1}$

         b) 3×10^{-4} mole $L^{-1} s^{-1}$

         c) 4×10^{-4} mole $L^{-1} s^{-1}$

         d) 6×10^{-4} mole $L^{-1} s^{-1}$

         19). 75 % of the first order reaction was completed in 32 min, 50% of the reaction was completed in

         a) 24 min.   b) 8 min   c) 16 min.   d) 4 min

      20) . In a tetragonal crystal

         a) a=b=c, α=β=90 ǂγ
         b) α=β=γ=90, a=bǂc
         c) α=β=γ=90, aǂbǂc
         d) α=β=90, γ=120, a=bǂc

21) The density of KBr is 2.75 g/cm^{-3}. The length of the unit cell is 654 pm. Atomic mass of K=39, Br=80. Then what is true about the predicted nature of the solid?

a) unit cell is fcc
b) Z=4
c) There are four constituents/unit cells
d) There are 8 ions at corners and 6 at the centres of the faces

22) Which of the following statement(s) is (are) correct

a) The co-ordination number of each type of ion in CsCl crystals is 8
b) A metal that crystallizes in bcc structure has a coordination number of 12
c) A unit cell of an ionic crystal shares some of its ions with other unit cells
d) The length of the unit cell in NaCl is 552 pm (rNa$^+$= 95 pm, rCl$^-$ = 181 pm)

23) Schottky defect in crystals is observed when

a) Unequal number of cations and anions are missing from the lattice
b) Equal number of cations and anions are missing from the lattice
c) an ion leaves its normal site and occupies an interstitial site
d) density of the crystal is increased

24) . The first order reflection of a beam of X-rays of wavelength 1.54 A° from the (1 0 0) plane of a crystal of the simple cubic type occurs at an angle of 11.29°. Caculate the length of the unit cell.

a) 3.68 X 10^{-8}cm
b) 4.68 X 10^{-8}cm
c) 3.68 X 10^{-7}cm
d) 3.68 X 10^{-9}cm

25) A crystal may have one or more planes of symmetry as well as one or more axes of symmetrybut it has

a) two centres of symmetry
b) no centre of symmetry
c) one centre of symmetry
d) four centres of symmetry

26) . The compressibility factor for 1 mole of a van der Waals gas at 0°C and 100 atm pressure is found to be 0.5. Assuming that the volume of a gas molecule is negligible, Calculate the van der Waals constant, a

a) 1.35 L^{2}atm mol^{-2}
b) 1.45 L^{2}atm mol^{-2}
c) 2.35 L^{2}atm mol^{-2}
d)1.25 L^{2}atm mol^{-2}

27) Knowing the average velocity of a gas at NTP, Calculate the temperature at which velocity would be doubled, other conditions remain the same

a) 719°C

b) 729°C

c) 829°C

d) 819°C

28) Calculate the pressure in atm, exerted by 10^{23} gas particles each of mass 10^{-22} g in a container of volume 1 litre. The rms speed is 10^5 cm/s. What is the total kinetic energy (In cal) of these particles? What must be the temperture ?

a) 43 atm, 1295 cal, 2398.7 K

b) 43 atm, 1195 cal, 2398.7 K

c) 33 atm, 1195 cal, 2398.7 K

d) 33 atm, 1295 cal, 2390.7 K

29) bulb of unknown volume contained an ideal gas at 650 mm pressure, A certain amount of gas was withdrawn and found to occupy 1.52 cc at 1 atm pressure. The pressure of the gas remaining in the bulb was 6oo mm. If all measurements were made at a constant temperature, find the volume of the bulb.

a) 24.1 cc

b) 23.1 cc

c) 25.1 cc

d) 25.5 cc

30) when 2 g of a gas A is introduced into an evacuated flask kept at 25°C , the pressure is found to be 1 atm, If 3 g of another gas B is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal gas behaviour, calculate the ratio of molecular weights $M_A : M_B$

a) 1/3

b) 2/3

c) ¼

d) 1/2

5.			
Q 1	Discuss Andrews Isotherm of Carbon dioxide with suitable graphical representation	**10**	**CO2**
Q 2	Draw structures of the following: Orthophosphoric acid, pyrophosphoric acid, orthophosphorous acid, hypophosphorous acid. Determine the oxidation state of phosphorous in each of the above compounds.	**10**	**CO3**
Q 3	For oxygen gas, at 25 ^{0}C [Collision diameter of oxygen molecule is 316 picometer), Calculate i) the mean free path at 1 atm pressure ii) the mean free path at 10^{-3} mmHg pressure iii) the number of collision per second per molecule (at 1 atm pressure) iv) the number of collision per cubic meter per second (at 1 atm pressure).	**10**	**CO2**
Q 4	State the deviation of real gas from ideal gas behavior, with suitable reasoning. Give the van der waal equation of state for real gases.	**10**	**CO2**