S'11 : 3AN : AN206 (1406)

ENGINEERING PHYSICS AND CHEMISTRY

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** *and* ALL *from* **Group C.**

*All parts of a question (a,b,etc.) should
be answered at one place.*

*Answer should be brief and to-the-point and be supplemented
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Group A

(*Engineering Physics*)

1. (*a*) What are emission and absorption spectra and how do
        you obtain these ? Write the expressions for Lyman,
        Balmer, Paschen spectral series and mention their range
        of electromagnetic spectrum.   3 + 2

    (*b*) In radio astronomy, hydrogen atoms are observed in
        which, for example, radiative transitions from $n = 109$
        to $n = 108$ occur. What are the frequency and
        wavelength of the radiation emitted in this transition ?   5

    (*c*) Mention the law of radioactive decay and define
        half-life of the radioactive decay.   5

    (*d*) Write in brief on nuclear fission and fusion.   5

2. (a) Write the basic idea behind Bohr's model of the atom. State the assumptions of Bohr's model. 5

(b) State Heisenberg uncertainty principle. Determine the de Broglie wavelength of a moving golf ball of mass $m = 0.05$ kg and velocity $v = 40$ m/s. 2 + 3

(c) What are crystalline and non-crystalline (amorphous) materials? 5

(d) Iron at 20 °C is BCC with atoms of atomic radius 0.124 nm. Calculate the lattice constant, a, for the cube edge of the iron unit cell. 5

3. (a) Calculate the atomic packing factor (APF) for the BCC unit cell, assuming the atoms to be hard spheres. 5

(b) (i) State the principle of superposition and explain the phenomenon of interference. What do you mean by constructive and interference? 3

(ii) What is slit spacing required to give a separation of 2 cm between the second and third-order maxima for two slits if $\lambda = 550$ nm and $D = 1.50$ m? 2

(c) Light of wavelength 580 nm is incident on a slit having a width of 0.3 mm. The viewing screen is 2.00 m from the slit. Find the positions of the first dark fringes and the width of the central bright fringe. 5

(d) Explain the meaning of spontaneous and stimulated emission and mention the features of these emissions. 5

4. (a) What do you mean by total internal reflection? How is this phenomenon utilized in an optical fiber? 5

(b) Write the assumption of kinetic theory of gases. 5

(c) What is meant by mechanical, thermal, chemical and thermodynamic equilibrium? State zeroth law of thermodynamics. 5

(d) Describe p-type and n-type extrinsic semiconductors in detail. 5

Group B

(Engineering Chemistry)

5. (a) What are the causes of environmental pollution? Discuss the toxic effects of CO and cyanide pollutants. What are the sources of sulphur dioxide pollutants in air? How are they controlled? 6

(b) A precipitate of 0.110 of calcium oxalate was obtained from 250 ml of a water sample. Explain the calcium content (in ppm). 4

(c) Assign E/Z and R/S configuration of the following molecule and write its IUPAC name. 4
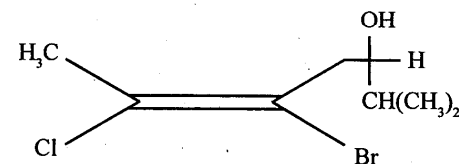
(d) Mention appropriate reasons for the following: 3 x 2

(i) Van der Waal's forces of attractions are responsible for the condensation of inert gases.

(ii) Chlorine is a diatomic molecule, while helium is a monoatomic molecule.

(iii) At room temperature, HF is a liquid, whereas HCl, having larger molecular mass, is a gas.

6.   (a) Explain, on the basis of molecular orbital theory, about the following :   3 + 2

     (i) Br_2 molecule is not stable

     (ii) N_2 has stronger bond than B_2.

   (b) Based on metallic bond, explain why metals are (i) good conductors of electricity, and (ii) malleable and ductile ?   3 + 2

   (c) What is meant by the term 'temperature coefficient of a reaction ? How would you explain, on the basis of collision theory, the effect of temperature on the rate of reactions ? The half life for the homogeneous gaseous reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$, which obeys first order kinetics, is 8 min. How long will it take for the concentration of SO_2Cl_2 to be reduced to 1% of the initial value ?   5 + 5

7.   (a) What are chemical cells ? Differentiate between reversible and irreversible cells.   7

   (b) Find the e.m.f. of the following at 25 °C :   7

     $Ag\,|\,Ag^+ (0.01M)\,||\,Ag^+ (0.1\ M)\,|\,Ag$

   (c) Give appropriate reason why solution of sodium chloride is a good conduction of electricity, but chlorine-water does not conduct electricity.   6

8.   (a) What is meant by 'space lattice' of a crystal ? Draw a unit cell for space lattices of face-centred cubic.   5

   (b) Mention various air pollutants and describe the effects of hydrogen sulphide on environment.   5

   (c) What are the important sources of water pollution ? Explain the activated sludge process of treatment of wastewater.   5

(d) A first order reaction is 15% complete in 20 min. How long will it take to be 60% complete ?   5

Group C

9.   (A) Choose the *correct* answer for the following :   5 x 2

     (i)   Which one of the following is *not* evidence for the wave nature of matter ?

       (a) The photoelectric effect

       (b) The diffraction pattern obtained when electrons pass through a slit

       (c) Electron tunneling

       (d) The validity of the Heisenberg uncertainty principle

     (ii)   A hole refers to

       (a) a positively charged electron.

       (b) an electron that has somehow lost its charge.

       (c) a microscopic defect in a solid.

       (d) the absence of an electron in an otherwise filled band.

     (iii)   Polarization experiments provide evidence that light is

       (a) a longitudinal wave.

       (b) a stream of particles.

       (c) a transverse wave.

       (d) some type of wave.

(*iv*) 1 atomic mass unit is about

 (*a*) 1.66×10^{-31} kg

 (*b*) 9.11×10^{-31} kg

 (*c*) 1.66×10^{-27} kg

 (*d*) 9.11×10^{-27} kg

(*v*) Photons in a laser beam have the same energy, wavelength, polarization direction, and phase because

 (*a*) each is produced in an emission that is stimulated by another.

 (*b*) all come from the same atom.

 (*c*) the lasing material has only two quantum states.

 (*d*) all photons are alike, irrespective of their source.

(B) Choose the *correct* answer for the following : 10 x 1

 (*i*) Which one of the following does not conduct electricity ?

  (*a*) Molten NaCl

  (*b*) NaCl crystal

  (*c*) Solution of NaCl in water

  (*d*) Solution of NaCl in alcohol

 (*ii*) For the first order reaction, half life is 14 s, the time required for the initial concentration to reduce to one-eighth of its value is

  (*a*) 28 s

  (*b*) 42 s

  (*c*) $(14)^3$ s

  (*d*) $(14)^2$ s

(*iii*) During electrochemical corrosion in acidic environment,

 (*a*) oxygen evolution occurs.

 (*b*) oxygen absorption occurs.

 (*c*) hydrogen evolution takes place.

 (*d*) hydrogen absorption takes place.

(*iv*) Which one of the following is *not* a strong electrolyte ?

 (*a*) $AgNO_3$

 (*b*) NaCl

 (*c*) NH_4OH

 (*d*) NaOH

(*v*) The molecule that has a linear structure is

 (*a*) CO_2

 (*b*) NO_2

 (*c*) SO_2

 (*d*) SiO_2

(*vi*) Arrange O_2, O_2^-, O_2^{2-}, O_2^{2+} in order of increasing bond length.

(*vii*) Man dies in the atmosphere of CO, because it

 (*a*) dries up the blood.

 (*b*) combines with O_2 present in the body.

 (*c*) reduces the organic matter of tissues.

 (*d*) combines with haemoglobin of blood, thereby making the latter incapable of absorbing O_2.

S'11 : 3AN : AN206(1406) (6) (*Continued*)

S'11 : 3AN : AN206(1406) (7) (*Turn Over*)

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(*viii*)   What is the effect of using unleaded petrol in automobiles ?

(*ix*)   3-ketobutene ($CH_2 = CHCOCH_3$) will exhibit one of the following absorption maxima in UV spectrum :

     (*a*) one

     (*b*) two

     (*c*) three

     (*d*) four

(*x*)   Which one of the following can cause depletion of ozone ?

     (*a*) H_2s

     (*b*) NO

     (*c*) Smoke

     (*d*) Aerosols

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S'12:5AN : AN 206 (1406)

ENGINEERING PHYSICS AND CHEMISTRY

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Group A
(Engineering Physics)

1. (a) Find the number of waves made by a Bohr electron in
         one complete revolution in its third orbit.   5

    (b) An alpha particle travels at right angle to a magnetic
         field of flux density 0.2 Wb/m^2 with a speed 6×10^5 m/s.
         Find the force acting on it and its acceleration.   5

    (c) Calculate the number of photons emitted per second
         by a 100 W sodium lamp assuming that the sodium
         light has $\lambda = 5896$ Å.   5

    (d) In a compton scattering, the incident photons have
         $\lambda = 3$ Å. Calculate the wavelength of the scattered
         radiation, if they are viewed at an angle of $60°$ to the
         direction of incidence.   5

(Turn Over)

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2.   (a)   In a drop of water having radius 10^{-3} m and molecular dipoles are pointed in the same direction. If the dipole moment of water molecule is 6×10^{-30} C-m, calculate the polarization.   5

     (b)   A magnetic material has a magnetization of 3200 A/m and flux density of $0 \cdot 0045$ Wb/m^2. Determine the magnetic field and the relative permeability of the material.   5

     (c)   A superconducting lead has a critical temperature of $7 \cdot 26$ K at zero magnetic field at a critical field of 8×10^5 A/m at O K. Find the critical field at 5K.   5

     (d)   Find the fraction of electrons excited into conduction band in Ge at 100 K, 300 K and 1200 K, if the band gap is $0 \cdot 75$ eV. Explain the results.   5

3.   (a)   Define the following : (i) Mean velocity, (ii) rms velocity, and (iii) most probable velocity. 3×2

     (b)   Calculate the mean translational kinetic energy per molecule of a gas at $727\,°$C. Given : $R = 8.32$ J/mole.K.   4

     (c)   Two coherent sources of intensity ratio β interfere. Prove that in the interference pattern   5

$$\frac{I_{max} - I_{min}}{I_{max} + I_{min}} = \frac{2\sqrt{\beta}}{1 + \beta}$$

     (d)   How many order will be visible if a light of wavelength $5000\,\text{Å}$ falls on a grating of line 2620 per inch.   5

4.   (a)   Draw a (111) plane and Wingez-Seitz cell.   5

     (b)   Find the atomic packing factor of HCP structure.   5

     (c)   Calculate the linear atomic density along [100], [110] and [111] direction in BCC iron whose lattice parameter is $2 \cdot 85$ Å.   5

     (d)   What do you understand by V symmetry ? Describe the types of crystal symmetry with examples.   5

Group B
(Engineering Chemistry)

5.   (a)   Discuss the standard method of monitoring of NO_x.   5

     (b)   Discuss the non-dispersive IR method for the analysis of CO pollutant.   5

     (c)   Differentiate between primary and secondary pollutants. Name five primary pollutants and discuss any one of them.   7

     (d)   Show the relationship between CO, NO_x and HC (hydrocarbons) with the help of a graph.   3

6.   (a)   What is the condition for metallic bonding ? Discuss any three metallic properties with explanation.   5

     (b)   Discuss different postulates of molecular orbital theory.   5

     (c)   Draw the molecular orbital diagram of O_2 molecule and discuss its magnetic properties.   10

7.   (a)   Discuss the mechanism of oxidation corrosion.   5

     (b)   Differentiate between electrochemical and galvanic series.   5

     (c)   Discuss about sacrificial anodic protection method.   5

     (d)   How much rust ($Fe_2O_3 \cdot 3H_2O$) will be formed when 100 kg of iron have completely rusted away ?   5

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8. (a) Explain and derive Lambert-Beer's law. What are its limitations ? 5

(b) What is meant by order of reaction ? Derive an expression for the rate constant of a second order reaction. 5

(c) What is zero-order reaction ? Derive the general equation for it. 5

(d) Show that in case of a first order reaction, the time requires for 99·9% of the reaction to take place is about 10 times that requires for half the reaction. 5

Group C

9. (A) Fill in the blanks : 5 × 2

(i) Interplanar spacing in terms of unit cell parameter is given as _____ .

(ii) The pure rotational symmetry which is not possible in crystalline solid is _____ .

(iii) The packing factor efficiency of a FCC structure is _____ .

(iv) A sample of Si, whose intrinsic carrier conduction is $9{\cdot}8 \times 10^{15}/m^3$ at 300 K, is made n-type material. If the density of donar atoms is $10^{21}/m^3$, then the density of hole is _____ .

(v) The maximum velocity of the emitted electron is _____ , if the light of wavelength $4300 \overset{\circ}{A}$ is incident on the surface of potassium whose work function is 2·3 eV.

(B) Fill in the blanks : 5 × 2

(i) Unit of rate constant of half order reaction is _____ .

(ii) The chemical formula of rust is _____ .

(iii) Chemical formula of EDTA is _____ .

(iv) The electrochemical corrosion always takes place at the _____ area.

(v) The atmospheric layer closest to the earth's surface is _____ .

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Group A

(Engineering Physics)

1. (a) Describe the Rutherford atomic model. What were
its outcomes ? Describe its applications.   10

   (b) Describe the laws of radioactivity and its decay.   10

2. (a) Explain the concept of wave function ? Explain its
physical meaning. Explain de-Broglie hypothesis.
What do you understand by expectation value ? 10

   (b) What type of forces exists in solids ? Explain with
neat diagrams. What do you understand by iso-
tropic and anisotropic behaviour of solids ?   10

(Turn Over)

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3. (a) What is the difference between insulator and dielectric ? Discuss the concept of polarization. Describe different types of polarization.   10

(b) Differentiate between semiconductor and super-conductor. Describe different types of super-conductors. Give examples of high temperature superconductors.   10

4. (a) Differentiate between heat and temperature. What do you understand by kinetic theory of gases ? Describe different models associated with it.   10

(b) What are three different types of particles ? Describe the Boltzman statistics.   10

Group B

(Engineering Chemistry)

5. (a) Describe different types of bonding in materials and describe the concept of hybridization. Discuss different types of hybridization.   10

(b) Classify organic compounds giving examples of each. What is the role of functional group ?   10

6. What do you understand by corrosion ? Describe its types with a neat diagram. What are the methods to prevent it.   20

7. Discuss the basic principle of UV spectroscopy. Describe its instrumentation, working and applications in detail. 20

8. (a) What are the different types of pollutants ? Discuss different chemical reactions in atmosphere.   10

(b) Explain the harmful effects of CO. How can it be controlled ?   10

Group C

9. Fill in the blanks : 10×2

(i) The clean water should have BOD value ———.

(ii) The compound added to petrol to act as anti-knock is ———.

(iii) Which of the hybridization has maximum s-character ———.

(iv) pOH of 10^{-8} M solution of NaOH will be ———.

(v) Solubility of BaF_2 in a solution of $Ba(NO_3)_2$ will be represented by the concentration term ———.

(vi) The magnitude, R, of the resultant translation vector between any two points is determined by the formula ———.

(vii) The interplanar spacing for cubic system is given by ———.

(viii) The energy (in eV) associated with an electron of wavelength 3×10^{-2} m is ———.

(ix) Bragg's law of X-ray diffraction is ———.

(x) The c/a ratio in an ideal hcp structure is ———.

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ENGINEERING PHYSICS AND CHEMISTRY

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Group A

(Engineering Physics)

1. (*a*) Explain the formation of a stable bond using the potential energy *vs.* interatomic distance curve. 5

   (*b*) Write an expression for the Fermi-Dirac distribution function and discuss its behaviour with change in temperature. 5

   (*c*) Describe *three* categories of dielectrics with examples. 5

   (*d*) Compare properties of ferromagnetic and ferro-electric materials. 5

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2. (a) According to Bohr's theory, the potential energy of electron in a hydrogen atom is negative and larger in magnitude than kinetic energy. Explain its significance.   5

(b) Explain how the experiment on α-particle scattering led to the concept of the nuclear model of the atom.   5

(c) Write different diffraction methods of determining crystal structure and describe *any one* method in detail.   5

(d) Describe the nature and origin of various forces existing between the atoms of a crystal.   5

3. (a) Write a note on the kinetic interpretation of temperature.   5

(b) Distinguish between isothermal and adiabatic processes. Show that the adiabatic is steeper than the isothermal at the point where they cross.   5

(c) What is a nuclear reactor ? What do you understand by criticality of a nuclear reactor ?   5

(d) Explain the basic principle of holography.   5

4. (a) What are extrinsic semiconductors ? At high temperature, an extrinsic semiconductor behaves like an intrinsic semiconductor — why ?   5

(b) What are HTSC oxides ? What are their future prospects from application of superconductivity viewpoint ?   5

(c) Distinguish between interference and diffraction. Explain why gratings with large number of lines are preferred.   5

(d) Explain what do you mean by polarisation of light. Distinguish between polarised light and unpolarised light.   5
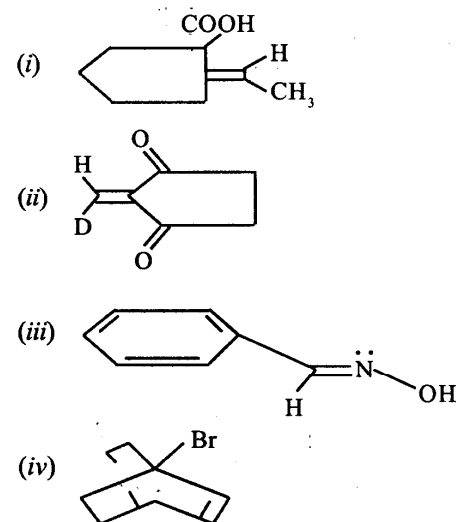
Group B

(Engineering Chemistry)

5. (a) What are the causes of environmental pollution ? Discuss the toxic effects of CO and cyanide pollutants. What are sources of sulphur dioxide pollutants in air ? How are they controlled ?   6

(b) A precipitate of 0.110 of calcium oxalate was obtained from 250 ml of a water sample. Express the calcium content (in ppm).   4

(c) Assign E/Z and R/S configuration of the following molecule and write its IUPAC name.   4

(d) Give suitable reasons for the following :   3 × 2

(i) H_2O is a liquid at room temperature while H_2S is a gas.

(ii) Chlorine is a diatomic molecule while helium is a monoatomic molecule.

(iii) At room temperature HF is a liquid, whereas HCl, having a larger molecular mass, is a gas.

6. (a) On the basis of molecular orbital theory, explain the following :   3 + 2

(i) Br_2 molecule is not stable

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(ii) N_2 has stronger bond than B_2.

(b) Based on metallic bond, explain why metals are   3 + 2

   (i) good conductors of electricity.

   (ii) malleable and ductile.

(c) What is meant by the term 'temperature coefficient of a reaction' ? How would you explain, on the basis of collision theory, the effect of temperature on the rates of reactions ? The half life for the homogeneous gaseous reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$, which obeys first order kinetics, is 8.0 min. How long will it take for the concentration of SO_2Cl_2 to be reduced to 1% of the initial value ?   5 + 5

7. (a) Draw stereodiagrams of the following :   3 + 3

   (i) (S)–2–methylbutanoic acid

   (ii) (R)–2–(ethoxycarbonyl) propanoic acid

(b) What is corrosion of metals ? Explain how corrosion can be controlled by sacrificial anode and impressed emf methods.   3 + 3

(c) Iron (II) oxide, FeO, crystal has a cubic structure and each edge of the unit cell is 5.0 Å. Taking density of the oxide as 4.0 $g.cm^{-3}$, calculate the number of Fe^{2+} and O^{2-} ions present in each unit cell.   4

(d) Distinguish between covalent and electro valent bond. Explain the structure of SF_6 molecule.   4

8. (a) How is electrode potential experimentally determined ? Distinguish between single electrode potential and standard electrode potential. A cell is formed by clipping Zn rod in 0.01 M Zn^{2+} solution and Ni-rod in 0.5 M Ni^{2+} solution. The standard electrode potentials of Zn and Ni are -0.76 V and -0.25 V, respectively. Write the cell representation, cell reaction and calculate the emf of the cell.   5 + 5

(b) State Ostwald's dilution law for a weak electrolytic solution. Derive the mathematical expression for a dilute solution and mention its limitations.   6

(c) Label the following configurations in terms of E/Z :   4

(i)

(ii)

(iii)

(iv)

Group C

9. (A) Write whether the following statements are *true* or *false* :   5 × 1

   (i) Transition elements have higher melting

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points and higher densities as compared to light metals.

(ii) The charge carriers in the discharge tube at very low pressures are electrons and positive ions.

(iii) If (3 2 6) are the Miller indices of a plane, the intercepts made by the plane on three crystallographic axes are (2a, 3b, c).

(iv) Most widely used conducting materials are copper and aluminium.

(v) In superconducting state, entropy increases and thermal conductivity decreases.

(B) Fill in the blanks :   5 × 1

(i) The temperature, at which metal becomes superconducting, is called ———.

(ii) The nature of binding for a crystal with alternate and evenly spaced positive and negative ions is ———.

(iii) In a unit cell, whose lattice constant is a, the distance between two {hkl} planes is ———.

(iv) The lattice constant of a BCC unit cell with atomic radius of 1.24 Å is ———.

(v) If elements with principal quantum number $n > 4$ were not allowed in nature, then the number of possible elements would be ———.

(C) Choose the *correct* answer for the following :   10 × 1

(i) Which one of the following does not conduct electricity ?

(a) Molten NaCl

(b) NaCl crystal

(c) Solution of NaCl in water

(d) Solution of NaCl in alcohol

(ii) For the first order reaction, half life is 14 s. The time required for the initial concentration to reduce to one-eighth of its value is

(a) 28 s

(b) 42 s

(c) $(14)^3$ s

(d) $(14)^2$ s

(iii) During electrochemical corrosion in acidic environment,

(a) oxygen evolution occurs.

(b) oxygen absorption occurs.

(c) hydrogen evolution takes place.

(d) hydrogen absorption takes place.

(iv) Which one of the following is not a strong electrolyte ?

(a) $AgNO_3$

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(b) NaCl

(c) NH_4OH

(d) NaOH

(v) The molecule having a linear structure is

(a) CO_2

(b) NO_2

(c) SO_2

(d) SiO_2

(vi) Arrange $O_2, O_2^-, O_2^{2-}, O_2^{2+}$ in order of increasing bond length.

(vii) Man dies in the atmosphere of CO because it

(a) dries up the blood.

(b) combines with O_2 present in the body.

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(c) three

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(x) Which one of the following can cause depletion of ozone ?

(a) H_2S

(b) NO

(c) Smoke

(d) Aerosols

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W'13 : 5 AN : AN 206 (1406)

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Group A
(Engineering Physics)

1. (a) Explain why a material should expand when heated.   5

    (b) What are non-ferrous alloys ? Give examples and
         write their uses.   5

    (c) Write the similarities and differences between ferro-
         magnetic and ferroelectric materials.   5

    (d) Discuss on the important categories of dielectrics
         with examples.   5

2. (a) Describe the properties exhibited by ionic solids.   5

    (b) Explain the important method suitable for the deter-
         mination of crystal structure.   5

(c) Find the radius of first orbit of electron in hydrogen atom (for hydrogen z = 1 and n = 1). **5**

(d) Explain how are insulating materials classified ? **5**

3. (a) Describe the differences between thermal expansion and thermal conductivity. **5**

(b) What are the properties exhibited by covalent solids ? Discuss in brief. **5**

(c) What is electronic conductivity ? Discuss the factors responsible for reducing its value. **5**

(d) Describe about the behaviour of cohesive force and repulsive force. **5**

4. (a) Give a clear explanation about intrinsic and extrinsic semiconductors. **5**

(b) Write the differences between polarised light and unpolarised light. **5**

(c) Justify why certain materials are magnetic while others are not. **5**

(d) Mention about interference and diffraction. Why are gratings with large number of lines preferred ? **5**

Group B
(Engineering Chemistry)

5. (a) Distinguish between the properties of ionic bonds and covalent bonds. **6**

(b) Explain the following on the basis of molecular orbital theory : (i) N_2 has stronger bond than B_2 ; and (ii) Br_2 molecule is not stable. **3 + 3**

(c) Explain how the nature of bond formed between any two atoms could be predicted, with the help of their electro-negativity values. **8**

6. (a) Explain how carbon dioxide is responsible for enhanced global warming. **5**

(b) List the chemicals depleting ozone layer. Discuss them briefly. **5**

(c) Describe the important characteristics of colloidal solution. **5**

(d) Justify why is a reaction speeded up in presence of a catalyst ? **5**

7. (a) What are the factors influencing corrosion ? Explain. **6**

(b) State Ostwald's dilution law for a weak electrolytic solution. Derive the mathematical expression for a dilute solution and write its limitations. **6**

(c) Explain the mechanism of electrochemical corrosion based on hydrogen evolution and by oxygen absorption. **8**

8. (a) What is electroplating ? Write the merits and demerits of the process of electroplating . **6**

(b) Write the effects of increase of temperature on the adsorption of a gas on a solid surface. **7**

(c) Explain the kinetics of saponification of ethyl acetate by an alkali. **7**

Group C

9. (A) Identify the *correct* answer for the following : **5 × 1**

(i) Which one of the following crystal structure characterises the ferritic stainless steel ?

(a) Body centred cubic

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(b) Face centred cubic

(c) Simple hexagonal

(d) Cubic

(ii) The nature of atomic bond found in diamond is

(a) covalent.

(b) ionic.

(c) metallic.

(d) hydrogen bond.

(iii) According to Pauli's exclusion principle, the maximum number of electrons with a principal quantum number is

(a) $2n$

(b) n^2

(c) $2n^3$

(d) $2n^2$

(iv) Which one of the following metals has face centred cubic structure ?

(a) Magnesium

(b) Gold

(c) Cadmium

(d) Zinc

(v) Select the hardest one among the following :

(a) Ferrite

(b) Austenite

(c) Cementite

(d) Pearlite

(B) Mention whether the following sentences are *true* or *false* :

5 × 1

(i) The phenomenon of emf development between two different metals placed in contact is known as 'Seeback effect'.

(ii) Cold-worked components are generally subjected to 'hardening'.

(iii) The highest percentage of chromium that can be added to steel is '50'.

(iv) The mass number of an atom is 40 and its atomic number is 20. The number of electrons present in that atom is '40'.

(v) The presence of nucleus in an atom was discovered by 'Rutherford'.

(C) Answer /Choose the *correct* answer for the following : 10 × 1

(i) The gas eliminated during decarbonylation of acetic acid is

(a) hydrogen.

(b) carbon dioxide.

(c) methane.

(d) carbon monoxide.

(ii) Match the following :

(A)	Propanone	(1)	CHO
(B)	Butanal	(2)	C = O
(C)	Ethanol	(3)	COOH
(D)	Acetic acid	(4)	OH

(a) A-4, B-1, C-3, D-2

(b) A-2, B-4, C-1, D-3

(c) A-2, B-1, C-4, D-3

(d) A-3, B-4, C-1, D-2

(iii) Define one mole.

(iv) Pick the odd one out and mention the reason :

    (a) Ethanol

    (b) Ethanal

    (c) Acetone

    (d) Nitric acid

(v) Plasticisers are added to plastic compounds to

    (a) improve resistance to acids.

    (b) provide a protective layer.

    (c) improve softness and flexibility.

    (d) increase tensile strength.

(vi) Write the causes for deforestation.

(vii) Ascertion (A) : Baking soda is used as an antacid.
Reason (B) : Antacid neutralises excess of acid in the stomach.

    (a) Both A and B are correct.

    (b) A is wrong and B is correct.

    (c) Both A and B are wrong.

    (d) A is correct and B is wrong.

(viii) Isotopes will have same —— and —— .

(ix) Write the reasons for landslides.

(x) Pick the odd one out and mention the reason :

    (a) HCl

    (b) HNO_3

    (c) $HCOOH$

    (d) H_2SO_4

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W'14 : 5 AN : AN 206 (1406)

ENGINEERING PHYSICS AND CHEMISTRY

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** and ALL *from* **Group C.**

*All parts of a question (a, b, etc.) should be
answered at one place.* ·

*Answer should be brief and to-the-point and be supple-
mented with neat sketches. Unnecessary long answer may
result in loss of marks.*

*Any missing or wrong data may be assumed suitably
giving proper justification.*

Figures on the right-hand side margin indicate full marks.

Group A

(Engineering Physics)

1. (a) Explain about the Bohr's atom model.   10

   (b) Justify whether protons and neutrons are part of the
       nucleus.   5

   (c) Discuss how nuclear power competes with other
       sources of electricity.   5

2. (a) Describe the characteristics of semi-metals.   5

   (b) Write about the effect of temperature on the
       dielectric constant.   7

(c) Explain the properties of ferroelectric materials and what makes them unique ?   8

3. (a) Explain the principle and mechanism of Brownian movement.   6

(b) Why should temperature be a measure of the average kinetic energy of molecules ? Explain.   5

(c) Write the relation between the radiating and absorbing powers of different bodies for light and heat.   5

(d) According to kinetic theory of gases, what happens at absolute zero temperature ? Justify.   4

4. (a) What is the difference between an amorphous solid and a crystalline solid ?   5

(b) Does the crystal geometry of the hygroscopic compound change between its anhydrous and hydrate forms ? Justify.   5

(c) Inert gases have completely filled outer shell, yet the boiling point of these increases with the atomic number. Explain why it is so.   5

(d) Discuss on isotropy and anisotropy.   5

Group B

(Engineering Chemistry)

5. (a) What is band model of the metallic bonding ?   5

(b) Explain the use of Fajan's rule for the prediction of relative non-polar character.   5

(c) What is the bond order of carbon monoxide with

ten bonding electrons and four anti-bonding electrons ?   5

(d) How do intermolecular forces compare in strength with those of ionic and metallic bonding ?   5

6. (a) What are the impacts of water pollution ? Explain how water pollution could be controlled.   6

(b) With an example, write the oxidation and reduction reaction in terms of electron transfer.   5

(c) Explain how global warming is effected due to green house gases ?   5

(d) With an example, write about the exothermic and endothermic reaction.   4

7. (a) With an example, write the procedure of titrations involved with EDTA.   5

(b) Discuss about the possibilities of galvanic corrosion.   5

(c) Explain how water-line corrosion is formed.   5

(d) Justify why cathodic protection is more effective method of resisting corrosion ?   5

8. (a) Describe the factors affecting reaction rate.   5

(b) Discuss on the principle of ultraviolet-visible absorption.   5

(c) Write the role of important forces in the interaction of colloid particles.   5

(d) Why is the priority pollutant analysis required ? How is the analysis performed ?   5

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Group C

9. (A) Choose the *correct* answer for the following :   5 × 1

(i) The conductivity of a conductor depends on its

(a) temperature.

(b) material.

(c) length and area of cross-section.

(d) both temperature and material.

(ii) Which one among the following will show anisotropy ?

(a) Paper   (b) Bacl$_2$

(c) Glass   (d) Wood

(iii) In an intrinsic semiconductor, the number of free electrons and holes are

(a) not the same.   (b) varying.

(c) equal.   (d) zero.

(iv) Which one of the following is not a constituent of a pyrophoric alloy ?

(a) Nickel

(b) Aluminium

(c) Neodymium

(d) Carbon

(v) According to Einstein,

(a) motion is absolute.

(b) there is no absolute space and all motions are relative.

(c) space is absolute.

(d) space is relative and motion is absolute.

(B) Write *true* or *false* for the following :   5 × 1

(i) The magnitude of induced emf is directly proportional to rate of change of magnetic flux.

(ii) The direction of flow of current and the direction of flow of electrons are always opposite.

(iii) Silver nitrate is an electronic conductor among the following :

(a) Sodium chloride

(b) Silver nitrate

(c) Aluminium

(d) Rubber

(iv) The resistance of a semiconductor decreases with decrease of temperature.

(v) If the intensity of light falling on a metal is increased, the photoelectric current increases.

(C) Answer the following :   10 × 1

(i) Choose the odd one out and mention the reason :

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(a) H_2SO_4 (b) HNO_3

(c) CH_3COOH (d) HCl

(ii) Select the correct compound(s) having zero dipole moments.

(A) maleic acid

(B) trans-1-bromo-2-chloroethane

(C) p-dichlorobenzene

(D) trans-2-butene

(a) A only,   (b) B only

(c) A, B and C (c) C and D.

(iii) What is aerobic oxidation ?

(iv) In acid medium, phenolphthalein shows

(a) pink colour.   (b) yellow colour.

(c) no colour.   (d) orange colour.

(v) Write the IUPAC name for the following acetylsalicyclic acid :
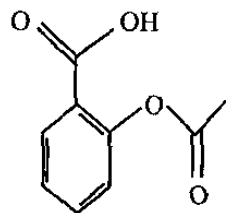
(vi) The equation used for calculating pH of a solution containing weak acid and its salt is

(a) $pKa = pH + log[salt/acid]$

(b) $pH = pKa + log[salt/acid]$

(c) $pH = pKa + log[acid/salt]$

(d) $pH = pKa - log[salt/acid]$

(vii) What is pitting corrosion ?

(viii) Select the odd one from the following :

(a) Pewter

(b) Type metal

(c) Solder

(d) Anglesite

(ix) Which one of the following is a gas ?

(a) n - propyl alcohol

(b) ethyl alcohol

(c) dimethyl ether

(d) di-n-propyl ether

(x) Write the reasons for ozone depletion.

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S'15 : 5 AN : AN 206 (1406)

ENGINEERING PHYSICS AND CHEMISTRY

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** and ALL *from* **Group C.**

*All parts of a question (a, b, etc.) should be
answered at one place.*

*Answer should be brief and to-the-point and be supple-
mented with neat sketches. Unnecessary long answer may
result in loss of marks.*

*Any missing or wrong data may be assumed suitably
giving proper justification.*

Figures on the right-hand side margin indicate full marks.

**Group A
(Engineering Physics)**

1. (*a*) Outline the contribution of Rutherford and Bohr to
the present understanding of atomic structure. For
each, describe their experiment and model of the
atom.   8

   (*b*) State the law of radioactive decay and arrive at the
expression for the number of atoms of a radioactive
element at any instant of time.   8

   (*c*) Mention the ideas which prompted de-Broglie to
propose his concept about matter waves.   4

2. (*a*) Explain the different types of polarization mecha-
nisms in dielectrics and sketch their dependence on
the frequency of applied electric field.   10

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(b) What are acceptor-type of impurities and what is P-type semiconductor ?   4

(c) Explain type I and type II superconductors.   6

3. (a) Explain the production of plane polarized light by Nicol prism.   5

(b) Explain the different methods used for pumping of atoms in laser action.   5

(c) What are the advantages of optical fibers in communication over ordinary cable communications ?   5

(d) What is law of equi-partition of energy? Find the values of $\gamma = cp/cv$ for diatomic gas, where symbols have their usual meanings.   5

4. (a) Explain how X-ray diffraction can be employed to determine the crystal structure. Give the ratio of interplanar distances of (100), (110) and (111) planes for a simple cubic structure.   10

(b) Illustrate graphically the variation of interatomic forces and potential energy with the spacing between the two atoms.   4

(c) What are Miller indices ? How will you determine the Miller indices of a given plane ? What are the distinct features of Miller indices ?   6

Group B
(Engineering Chemistry)

5. (a) List any *four* differences between ionic and covalent bond.   8

(b) Explain the bond order of nitrogen molecule.   6

(c) Compare and contrast the terms, order and molecularity of a reaction.   6

6. (a) Explain on the hemolytic and heterolytic fission.   6

(b) Differentiate between enantiomer and diastereomer.   6

(c) Explain the principle involved in the determination of hardness of water by EDTA titration.   8

7. (a) Discuss any *four* factors affecting adsorption process.   4

(b) What is corrosion of metals? Describe the mechanism of electrochemical corrosion by (i) hydrogen evolution and (ii) oxygen absorption.   8

(c) Write an account of the Arrhenius theory of electrolytic dissociation.   8

8. (a) A certain first order reaction is 75% complete in 1000 sec. Calculate its half-life and rate constant.   7

(b) Give two sources from which the following pollutants generated : (i) SO_2 and (ii) CO. Mention their effects on human life.   7

(c) Write a note on organic pollutants and their effects on human and plant life.   6

Group C

9. (A) Choose the *correct* answer for the following :   10 × 1

(i) Of various series of the hydrogen spectrum, the one which lies wholly in the ultraviolet region is

(a) Bracket series   (b) Balmer series

(c) Lyman series   (d) Paschen series

(ii) The critical mass of a fissionable material is

(a) one kilogram equivalent.

(b) the minimum mass needed for chain reaction.

(c) the rest mass equivalent to 1020 J.

(d) 3.5 kg.

(iii) A pure semiconductor has

(a) an infinite resistance at $0\,°C$.

(b) a finite resistance which does not depend upon temperature.

(c) a finite resistance which decreases with temperature.

(d) a finite resistance which increases with temperature.

(iv) Ferroelectric is

(a) one which conducts only in presence of electric field.

(b) magnetic material which is also good conductor of electricity.

(c) the non-conductor whose polarization is caused by an electric field.

(d) the non-conductor which has permanent atomic polarization even in the absence of electric field.

(v) Which one of the following is not a postulate of kinetic theory of gases ?

(a) Molecules of a gas are perfectly elastic spheres.

(b) Molecules of a gas are mere point masses.

(c) Molecules of a gas are not always in motion.

(d) Molecules of one gas are different from others.

(vi) A gas behaves as an ideal gas

(a) at very low pressure and high temperature.

(b) high pressure and low temperature.

(c) high temperature and high pressure.

(d) low pressure and low temperature.

(vii) Which one of the following statement is wrong ?

(a) Infrared photon has more energy that the photon of visible light.

(b) photographic plates can be made sensitive to infrared rays.

(c) photographic plates are sensitive to ultra-violet rays.

(d) Infrared rays are visible but can cast shadows like visible light rays.

(viii) Deviation produced in a grating is independent of

(a) grating element.

(b) wavelength of light used.

(c) refractive index of the material of grating.

(d) None of the three above.

(ix) Electron sea exists in

(a) polar bond.

(b) ionic bond.

(c) covalent bond.

(d) metallic bond.

(x) Which one of the following statements is *not* true ?

(a) Vacancy defect results in a decrease in the density of the substance.

(b) Interstitial defect results in an increase in the density of the substance.

(c) Impurity defect has no effect on the density of the substance.

(d) Frankel defect results in an increase in the density of the substance.

(B) Choose the correct answer for the following : 10 × 1

(i) Arrange the covalent bonds C–F, C–Br, C–Cl and C–I in increasing order of strength.

(a) C–I < C–Br < C–Cl < C–F

(b) C–Br < C–I < C–Cl < C–F

(c) C–I < C–CI < C–F < C–Br

(d) C–Br < C–CI < C–F < C–I

(ii) Which one of the following has net dipole moment ?

(a) CO_2 (b) BF_3

(c) NH_3 (d) CCl_4

(iii) The most stable carbonium ion among the following is

(a) methyl carbonium ion.

(b) primary carbonium ion.

(c) secondary carbonium ion.

(d) tertiary carbonium ion.

(iv) Write the IUPAC name to the following compound : $CH_3–CH_2–CH_2–Br$.

(v) Identify the chiral molecule among the following :

(a) isopropyl alcohol

(b) isobutyl alcohol

(c) 2-pentanol

(d) 1-bromo-2-butane

(vi) The migration of colloidal particles under the influence of an electric field is known as

(a) electro osmosis.

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W'15: 5 AN: AN 206 (1406)

ENGINEERING PHYSICS AND CHEMISTRY

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,** ANY TWO *from* **Group B** and ALL *from* **Group C.**

All parts of a question (a, b, etc.) should be answered at one place.

Answer should be brief and to-the-point and be supplemented with neat sketches. Unnecessary long answer may result in loss of marks.

Any missing or wrong data may be assumed suitably giving proper justification.

Figures on the right-hand side margin indicate full marks.

Group A

(Engineering Physics)

1. (*a*) Describe Rutherford's model of the atom. What are its limitations ? Obtain Bohr's quantization condition on the basis of the wave picture of an electron and discuss the postulates of Bohr's atomic model.   8

   (*b*) Explain proton-neutron hypothesis of nuclear composition. Express various terms used to describe nuclear composition.   4

   (*c*) Define the term 'radioactive decay'. Explain the process of α-decay with a suitable example.   4

   (*d*) Discuss the propagation mechanism of light waves in optical fiber.   4

2. (*a*) Differentiate between conductors, insulators and

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semiconductors on the basis of a energy band diagram.   6

(b) What is meant by superconductivity ? Write some important properties of superconductors.   4

(c) What is a dielectric substance ? Discuss different types of polarization in dielectrics.   4

(d) Explain piezo, pyro, and ferroelectric phenomenon in materials.   6

3. (a) State the basic assumption of the kinetic theory of an ideal gas and show that the pressure exerted by ideal gas is two-third of its kinetic energy per unit volume.   8

(b) What is Brownian motion ? Explain it on the basis of Einstein's theory of Brownian motion.   4

(c) What is a nuclear reactor ? Explain its principle, construction and working.   4

(d) By Brewster's law, show that light incident on a transparent substance at polarising angle gives reflected and refracted rays at right angle to each other.   4

4. (a) Discuss the principle of superposition. Explain, on the basis of it, the interference of light and obtain the conditions for the constructive and destructive interference. State the condition required to obtain distinct and sustained interference.   8

(b) Describe a unit cell. Determine the number of atoms per unit cell in simple cubic, face centered cubic and body centered cubic lattice.   4

(c) Show that the Lattice constant for a cubic lattice is given as $a = (nM / N\rho)^{1/3}$, where the symbols have their usual meanings.   4

(d) What is meant by binding energy of a crystal ? Explain the interatomic forces in solids with the help of a potential energy curve.   4

Group B

(Engineering Chemistry)

5. (a) Define Lattice energy. How does the solubility of an ionic solid depend upon its lattice energy ?   8

(b) Explain the term 'bond length', 'bond energy' and 'bond angle'.   6

(c) How many lone pairs and bonded pairs are present in CIF_3 ? Write the shape and type of hybridization.   6

6. (a) Differentiate between an electrochemical cell and electrolytic cell.   6

(b) What are corrosion inhibitors ? Discuss cathodic and anodic inhibitors.   6

(c) Explain Beer-Lambert's law with its limitations.   8

7. (a) For a first order reactions, the rate constants are 3.20×10^{-4} sec^{-1} at 600 K and 1.60×10^{-2} sec^{-2} at 1200 K. Calculate the energy of activation of the reaction. Take $R = 8.314$ JK^{-1} mole^{-1}.   7

(b) What are major air pollutants ? Describe sources of pollution, harmful effects and methods to control the following pollutants : H_2S, SO_2, CO.   7

(c) What are the factors responsible for depletion of ozone layer with their chemical reactions ?   6

8. (a) Describe the use of EDTA in estimation of metals by complexometric method.   6

(b) Justify the optical activity of a molecule associated with the presence of an asymmetric carbon atom in it with a suitable example.   7

(c) Differentiate between diamond and graphite on the basis of their crystal structure.   7

Group C

9. (A) Choose the *correct* answer for the following :   10 × 1

(i) Which one of the following is correct in respect of an electron and a proton having same de Broglie wavelength of 2 Å ?

    (a) Both have same kinetic energy.

    (b) The kinetic energy of proton is more than that of electron.

    (c) Both have same velocity.

    (d) Both have same momentum.

(ii) Heisenberg's uncertainty principle

    (a) establishes the Bohr's orbital concept.

    (b) establishes the existence of electron inside the nucleus.

    (c) is not observable for the macroscopic object.

    (d) does not agree with the de Broglie hypothesis.

(iii) van der Waals' bond is formed due to

    (a) the sharing of valence electrons.

    (b) attraction between positive ion cores and electrons.

    (c) electrostatic attraction between oscillating or permanent dipoles.

    (d) electrostatic force of attraction between ions.

(iv) On increasing the temperature of intrinsic semiconductor,

    (a) the resistance of semiconductor increases.

    (b) the conductivity of semiconductor decreases.

    (c) holes are produced in the conduction band.

    (d) the conductivity of semiconductor increases.

(v) The unit of polarization $\vec{P}$ is

    (a) same as that of $\vec{E}$.

    (b) same as that of $\vec{D}$.

    (c) same as that of $\vec{E}$/coulomb.

    (d) same as that of charge.

(vi) According to the kinetic theory of gases,

    (a) mean kinetic energy per molecule is directly proportional to the square root of absolute temperature of the gas.

    (b) root mean square speed of molecules is directly proportional to its pressure.

    (c) pressure of gas is directly proportional to the mean speed of molecules.

    (d) the rate of diffusion of gas is directly proportional to the root mean square speed of molecules.

(*vii*) The condition of minima in the diffraction pattern due to a single slit [width *e*] is

(*a*) $(e + d) \sin \theta = n\lambda$

(*b*) $e \sin \theta = n\lambda$

(*c*) $e \sin \theta = 1/n\lambda$

(*d*) None of the three above.

(*viii*) In the population inversion,

(*a*) number of electrons in higher energy state is more than the ground state.

(*b*) number of electrons in lower energy state is more than higher energy state.

(*c*) number of electrons in higher and lower energy states are the same.

(*d*) None of the three above.

(*ix*) In a simple cubic crystal, the ratio of spacings of (110) and (111) planes is

(*a*) 0.816   (*b*) 0.707

(*c*) 1.225   (*d*) 1.732

(*x*) Determine the Miller indices of plane parallel to the *z* axis and cut intercepts of 2 and 2/3 along *x* and *y* axis, respectively.

(*a*) 1 : 2 : 3   (*b*) 3 : 2 : 0

(*c*) 1 : 3 : 0   (*d*) 2 : 2 : 0

(B) Choose the *correct* answer for the following :   10 × 1

(*i*) The aqueous solution of KCN could be

(*a*) acidic.   (*b*) alkaline.

(*c*) neutral.   (*d*) None of the three above.

(*ii*) Which one of the following has the shortest bond length and highest bond energy :

(*a*) NO   (*b*) NO^{+} (*c*) NO^{2-} (*d*) NO^{-}

(*iii*) The value of rate constant of a pseudo first order reaction

(*a*) depends on the concentration of reactants present in small.

(*b*) depends on the concentration of reactants present in excess.

(*c*) is independent of the concentration of reactants.

(*d*) depends only on temperature.

(*iv*) Hydrocarbons that contain one or more benzene rings are classified as

(*a*) cyclic.   (*b*) hexagonal.

(*c*) aliphatic.   (*d*) aromatic.

(*v*) Enantiomers are

(*a*) molecules that have a mirror image.

(*b*) molecules that have at least one stereogenic centre.

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(c) non-superposable constitutional isomer.

(d) non-superposable molecules that have mirror image of each other.

(vi) The basic principle of Cotrell's precipitator is

(a) Le-Chatelier's principle.

(b) peptization.

(c) neutralization of charge on colloidal particles.

(d) scattering of light.

(vii) Which one of the following transitions has the highest energy transition.

(a) n to σ^* (b) n to Π^*

(c) σ to σ^* (d) Π to Π^*

(viii) In Mohr's method for the estimation of silver, which one of the following indicators is used :

(a) Potassium chromate

(b) Potassium nitrate

(c) Erichrome Black T

(d) Ferric ions

(ix) Which one of the following is used as an indicator in the EDTA titration :

(a) Methyl orange   (b) Methyl red

(c) Ferroine   (d) EBT

(x) The unfavourable alternation of environment due to human activities is termed as

(a) ecological disturbance.

(b) catastrophe.

(c) ecological degradation.

(d) pollution.

S'16 : 5 AN : AN 206 (1406)

ENGINEERING PHYSICS AND CHEMISTRY

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,** ANY TWO *from* **Group B** *and* ALL *from* **Group C.**

All parts of a question (a, b, etc.) should be answered at one place.

Answer should be brief and to-the-point and be supplemented with neat sketches. Unnecessary long answer may result in loss of marks.

Any missing or wrong data may be assumed suitably giving proper justification.

Figures on the right-hand side margin indicate full marks.

Group A

(Engineering Physics)

1. (a) Describe the postulates of Bohr atom model.   4

   (b) Explain the results of Rutherford α -particle scattering experiment.   6

   (c) Derive an expression for de Broglie wavelength of matter waves.   6

   (d) Define Thomson coefficient.   4

2. (a) Explain the variation of photoelectric current with applied voltage.   8

   (b) Distinguish between electric potential and potential difference.   4

(*Turn Over*)

(c) Mention the characteristics of electromagnetic waves.   4

(d) Discuss about self-inductance and mutual inductance.   4

3. (a) Explain the origin of characteristic X-rays.   6

    (b) Write the concept of space, time and mass.   4

    (c) Explain the energy band structure of the insulator, semiconductor and conductor.   6

    (d) Describe about the dielectric polarisation.   4

4. (a) Explain the principle of transformer. Discuss about its construction and working.   6

    (b) Define superconductivity. Write the important applications of superconductors.   4

    (c) Describe the principle of superposition of waves.   4

    (d) Explain about emission and absorption spectra.   6

Group B

(Engineering Chemistry)

5. (a) Explain the factors that affect electronic affinity.   6

    (b) Describe the shapes of S, P and d orbitals.   4

    (c) Discuss in detail about the nature of glass.   6

    (d) Justify how $\left[FeF_6\right]^{4-}$ differs from $\left[Fe(CN)_6\right]^{4-}$.   4

6. (a) Give an account on the Arrhenius theory of electrolytic dissociation.   8

    (b) Explain why H_2O is liquid while H_2S is a gas.   4

(c) Describe the Pauling method to determine ionic radii.   4

(d) Write the properties of ionic crystals.   4

7. (a) Explain the importance of chlorophyll in environmental chemistry. Write its function.   6

    (b) Describe about the molecular orbital theory.   6

    (c) Discuss, with examples, about the chromophores.   4

    (d) Distinguish between primary, secondary and tertiary amines.   4

8. (a) Explain, with examples, about esterification reaction.   6

    (b) Discuss, with examples, on common ion effect.   4

    (c) Explain, with examples, about carbohydrates.   6

    (d) Distinguish between benzylamine and aniline.   4

Group C

9. (A) Choose the *correct* answer for the following : 10×1

    (i) The conductivity of a conductor depends on its

      (a) temperature.

      (b) material.

      (c) length and area of cross-section.

      (d) both temperature and material.

    (ii) The magnitude of induced emf is directly proportional to

      (a) magnetic flux density.

(b) rate of change of magnetic flux.

(c) magnetic flux.

(d) magnetic flux gradient.

(iii) The prediction of electromagnetic waves was by

(a) Huygens   (b) Laplace

(c) Maxwell   (d) Max Planck

(iv) The elliptical shape of the orbits was proposed by

(a) J J Thomson   (b) Sommerfield

(c) Bohr   (d) Rutherford

(v) N-type semiconductors are formed by doping

(a) tetravalent element with monovalent.

(b) trivalent element with tetravalent element.

(c) tetravalent element with pentavalent element.

(d) trivalent element with pentavalent element.

(vi) In electron microscope, the electron beam is focussed by varying the

(a) velocity of electron.

(b) current through energising coil.

(c) wavelength of electron.

(d) thickness of colloidal film.

(vii) The ordinary and extraordinary ray travel with the same velocity along

(a) crystallographic axis.

(b) stress axis.

(c) optic axis.

(d) X-axis of the crystal.

(viii) The energy required to knock-out an electron from an atom is called as

(a) micropotential.

(b) electromagnetic potential.

(c) excitation potential.

(d) ionisation potential.

(ix) The focal length of the magnetic lens depends on

(a) velocity of the electron.

(b) power of the lens.

(c) microwaves.

(d) refractive index of the rays.

(x) The coupling capacitor in a two-stage amplifier is also called as

(a) potential capacitor.

(b) series capacitor.

(c) blocking capacitor.

(d) condenser.

(B) Choose the *correct* answer for the following : 10×1

(i) The electron affinity is a measure of the

(a) tendency of an atom to change into a cation.

(b) tendency of an atom to change into an anion.

(c) difficulty with which an electron is removed from an atom.

(d) reducing power of an atom.

(ii) The chief ore of copper is

(a) copper glance.

(b) ruby copper.

(c) both copper glance and ruby copper.

(d) copper pyrite.

(iii) Identify the double salt from the following :

(a) Copper ferrocyanide

(b) Potassium ferrocyanide

(c) Potash alum

(d) Potassium sulphate

(iv) The force which is not found in molecular crystal is

(a) coulombic forces.

(b) dipole-dipole interaction.

(c) van der Waals' forces.

(d) intermolecular forces.

(v) Molecularity of a reaction

(a) can be fractional.

(b) is the same as order of the reaction.

(c) can be zero.

(d) is always an integer.

(vi) Substances which completely destroy the activity of catalyst are called

(a) auto catalyst.   (b) catalyst poison.

(c) promotors.   (d) inhibitors.

(vii) Which one of the following is opaque to light ?

(a) $BaSO_4$ suspension   (b) NaCl solution

(c) Milk   (d) Wine

(viii) Isomers, which are interconvertible through the rotation about C-C single bond, are

(a) positional isomers.   (b) diasteromers.

(c) conformers.   (d) enantiomers.

(ix) High boiling point of phenol is due to

(a) acidic nature.

(b) intermolecular hydrogen bonding.

(c) covalent bonding.

(d) resonance.

(x) Amino acids contain the functional group as

(a) $-NH_2$ and $-CHO$

(b) $-COOH$ and $-OH$

(c) $-NH_2$ and $-SO_3H$

(d) $-COOH$ and $-NH_2$

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