**Applied Chemistry question paper**

**Examination, Nov – Dec (2012**)

Note : (i) solve all the five question .

(ii) part (a) of each unit is compulsory.

(iii) Attempt any two parts out of (b) , (c) , (d) of each question.

Q. 1 (a) Hardness of the water is the properly which prevents the lathering of soap.

Write chemical reaction involved in it.

(b) What are boiler problems? Explain one problem in detail mentioning causes,

Effects and its prevention.

Or

What is alkalinity? What alkalinity of water cannot be due to the presence of OH-

CO23 and HCO3- at a time.

A water sample is alkalinity to both phenolphthalein as well as methyl orange.

200 ml of the water sample on titration with N/50 HCl required 9.4 ml of the acid to phenolphthalein end point. When a few drops of methyl orange were added to the same solution and the titration was continued , the yellow colour of the solution turned to pink on addition of 21.0 ml of total acid solution. Find out the type and amount of alkalinities present in the water sample. 5

© (i) Explain disinfection process /methods for drinking water. Write motes on

Break points chlorination.

(ii) What do mean by deionization process? Explain the concept of deionization and

Ion exchangers. “It is one of the softening processes.” Justify the statement.

Or

Write short notes on any two of the following: **3 ½ +3 1/2**

1. Carbonate conditioning
2. Limitation of Zeolite method of water softening.
3. Caustic Embrittlement

(d) The analysis of raw water and treated water as follows:

Analysis of raw water: Ca2+ = 300 ppm; Mg2+ = 150 ppm ; HCO3- = 244 ppm; CO2 = 60 ppm.

Analysis of treated water: OH- = 65 ppm; CO2-3 = 40 ppm

(ii) If 10,000 litres of sane water sample is softened through a zeolite softener, how much

NaCl will be required for its regeneration? **7**

Q. 2 (a) what is the criteria to decide the efficiency of fuel? What is the experimental method to

determine it? **2**

(b) (i) Differentiate between Low temperature carbonization and High temperature carbonization.**3**

(ii) A sample of coal containing, C = 92% H = 5% and ash = 3% when this coal was in the laboratory for its calorific value in the bomb calorimeter, the following data were obtained:

Weight of coal burnt = 0.95 g

Weight of water taken = 700g

Water equivalent of bomb and calorimeter = 2,000 g

Rise in temperature = 2.48o C

Cooling correction = 0.02o C

Fuse wire correction = 10.0 cal

Acid correction = 60.0 cal

Calculate the net and gross calorific values of the coal in cal/g (Assume the latent heat of steam = 580 cal/g) **4**

© (i) what is the Importance of analysis of flue gas ? **2**

(ii) A coal sample was found to contain: C = 66.2% ; H = 4.2 % ; O = 6.2% ; N = 1.4% ; S = 2.9% ; moisture = 9.7% and ash = 9.5% by weight .Calculate the quantity of dry products of combustion, if 1 Kg of coal is burnt with 25% excess air. **5**

(d) (i) Coal sample is analysed by proximate and ultimate analysis in laboratory .Explain any one

With its significance. **31/2**

(ii) Coke is preferred in metallurgical process as compared to coal, why? Explain advantages of

Otto – Hoffman oven method.  **31/2**

**Unit - III**

**Q. 3.** (a) Explain how rusting of iron is prevented by galvanization. **2**

(b) what is dry corrosion ? Explain chemical corrosion with its mechanism **2+5**

© what are engineering methods to protect from corrosion ? Explain stress corrosion

and waterline corrosion in detail . **3 +4**

Or

Write short notes on any two: **31/2 + 31/2**

1. Concentration cell corrosion ;
2. Pitting corrosion ;
3. Solar cell

(d) (i) Write charging and discharging reactions of lead storage battery . **31/2**

(ii) What are fuel cells? What are its advantages and limitations? **31/2**

**Unit – IV**

**Q. 4.** (a) Give reason – PVC is sort and flexible; whereas Bakelite is hard and brittle. **2**

(b) Name the raw materials of Portland cement. Draw a labeled diagram of manufacture

of Portland cement by wet method. **7**

**Or**

What are the functions of lubricants? Explain the mechanism of fluid film lubrication.  **7**

© How lubricant can be classified? In case of high load and high speed of the machine which type

Of lubrication is preferred? Explain its mechanism. **7**

(d) Write short notes on the following (any two) : **31/2 + 31/2**

1. Different between thermoplastic and thermosetting resins.
2. I.S.I. specification of Portland cement.
3. To enhance the quality of rubber, some extra compounds are mixed in rubber. Write the mechanism of this process.

Or

Give preparation, properties and uses of: **31/2 + 31/2**

1. Poly vinyl chloride ;
2. Teflon

**Unit – V**

**Q.5**  (a) Detonators are used in conjugation with high explosives. Why **2**

(b) Give preparation, properties and uses of any two of the following: **31/2 x 2**

(i) Glycerol

(ii) Melamine

1. Carbon tetra chloride.

© (i) what are explosives? Write the important characteristic of explosive. **31/2**

(ii) Explain Chemical composition, explosive nature and application of Dynamite or RDX. **31/2**

Or

Define propellant. How are they classified Give with suitable examples **7**

(d) (i) Give preparation and application of lead azide. **3**

(ii) Calculate the oxygen balance of: **4**

1. TNB (mol . wt = 213 )
2. RDX (C3H6N6O6 ) (mol. Wt =222)
3. Ammonium nitrate (NH4NO3) (mol. Wt = 80)
4. Lead Azide (pb(N3)2) (mol. Wt = 290)

**Applied Chemistry question paper**

**Examination, April – May (2012**)

Note: (i) solve all the five question.

(ii) Part (a) of each unit is compulsory.

(iii) Attempt any two parts out of (b), (c) , (d) of each question.

**Unit - 1**

**Q.1** (a) (i) 0.35o Cl = \_\_\_\_\_\_\_\_\_ oFr =\_\_\_\_\_\_\_\_\_\_\_mgL-1 = \_\_\_\_\_\_\_\_\_\_\_\_meqL-1. **1**

(ii) Chemical formula of coagulant ‘copperas ‘ is \_\_\_\_\_\_\_\_\_\_\_ . **1**

(b) Describe complexometric method for determination of hardness of water, on following

Heads: principle & theory, procedure, Observation, Calculation. **7**

Or

Draw the structure of EDTA – Ca complex. Give the chemical formula of Eriochrome Black T. **2**

100 mL of standard hard water,prepared by dissolving 1.5 mg CaCl2 per litre consumed 50mL EDTA sample water consumed 25 mL of same EDTA solution. 50mL boiled water sample consumed 15 EDTA solution. Calculate total, temporary & permanent hardness of water in ppm , oCl , oFr. **5**

© What is Sequestration? State its objective Describe various types of conditioning done in boiler

feed water.  **7**

**OR**

Bleaching powder added to drinking water kills microorganism. Justify. **2**

Draw break points curve & explain the break point chlorination, with emphasis on obtaining ‘dip’ in curve. Enumerate the significance of break point chlorination. **5**

(d) Analysis of Shivnath water gave following results (ppm) : **7**

MgSo4 = 38

CaSo4  = 50

H2So4  = 196

Ca (HCO3)2 = 25

NaCl = 10.00

CO2 = 22

Al2(SO4)3 as Coagulant = 34.2

Calculate the cost & amount of lime and soda required for softening of 10 million litres of water. When the % purity of it was 90% & 80% respectively. The cost of lime & soda per kg was 5.00 Rs & 8.00 Rs.

If this water is to be used as potable water ; calculate total hardness of water in ppm.

**Unit - II**

Q. **2 .** (a) (i) Grass calorific value & Net calorific value of fuel are interrelated as -----------------

(Give equation.) **1**

(ii) Valuable by products obtained from carbonization of coal by Otto Haffmann’s

Byproduct oven are ---------------- (Give names) **1**

(b) Describe the determination of calorific value of non volatile liquid by Bomb calorimeter: **7**

(i) Diagram

(ii) Construction

1. Working
2. Observation
3. Calculation
4. Corrections

© A sample of coal was analysed as following : **7**

2.5 g coal weighed in silica crucible heated for 1 hour , the residue weighed was 2.415 g. crucible was then covered with a vid and strongly heated for seven minutes at 950 +\_ 25oC. The residue weighed 1.528 g. the crucible was then heated without cover until constant weight was obtained. The last residue was found to weigh 0.245 g. calculate percentage result of above analysis. The ash obtained was extracted with H2SO4 , and acid extract was heated with BaCl2 . The precipitate BaSO4 was filtered dried & weight to be 0.5 g. Calculate the percentage of Sulphur in coal.

Or

A producer gas has the following composition by volume:

CH4 = 4.0% , CO = 26.0% , H2 = 10.0% , CO2 = 10.0% & N2 = 50% , Calculate : **7**

1. Minimum air required for complete combustion of 500 m3 of fuel.
2. % Composition of dry product of combustion by volume, when 25% of excess air was used for combustion.
3. Volume occupied by air obtained theoretically /m3 of fuel at NTP.

(d) Attempt any two of the following: **3** **½ x 2**

1. Differentiate between Octane & Cetane value.
2. Knocking is related to chemical composition of gasoline and affects the efficiency of engine. Justify.
3. Requisites of metallurgical coke obtained from high temperature carbonization.

**Unit - III**

**Q. 3.** (a) how much rust , Fe2O3.3H2O will be formed when 100 kg iron ore have completely

rustle (mol .wt of rust = 214)

(b) Describe the electrochemical corrosion of iron . Enumerate types of electrochemical corrosion**. 7**

© Attempt any two of the following **: 3 ½ x 2**

1. Factors influencing the corrosion
2. Galvanization of iron articles is preferred to tinning. Give reason
3. Differentiate between primary & secondary batteries.

(d) What are fuel cells? Describe Hydrogen Oxygen fuel cell and its prospects in space craft’s.

OR

What are solar cells? Describe role of semiconductor in solar cells. **7**

**Unit – IV**

**Q. 4. (a)** (i)Ziegler Natta catalyst is used to prepare ---------------- type of polymer. **1**

(ii) A good lubricant should have ----------------------- Aniline point. **1**

**(b)** Describe the mechanism of extreme pressure lubrication.  **7**

OR

What are constitutional compound of cement? Explain setting & hardening of Portland cement.

**©** write short notes on following (any two): **3 ½ x 2**

1. Vulcanization of natural rubber increases tensile strength .
2. Terylene as important polymer in fibre industry .
3. Graphite is an excellent solid lubricant.

(d) Viscosity & viscosity index is significant property of lubricant oil. Justify .

An oil sample under test has saybolt universal viscosity same as that of Gulf oil & Pennsylvanian oil at 210oF .their SUV at 100oF are 61, 758, 420 sec. respectively. Calculate VI of sample oil. **7**

OR

Describe preparation, properties and application of:

1. Silicone rubber
2. Bakelite

**Unit - V**

Q. 5. (a) (i) RDX explosive is chemically ----------------- . **1**

(ii) Alfred Nobel invented --------------- which is chemically -----------------. **1**

(b) Describe preparation, properties and applications of (any two) **3 ½ x 2**

(i) Ammonium nitrate

(ii) Ethyl alcohol

1. Acrylonitrile

© Describe the classification of Explosives, giving suitable examples, calculate the oxygen balance

Of the following: **5 + 2**

1. 2 , 4 , 6 TNT (mol . wt = 227 )
2. PETN (C5H8N4O12) (MOL. WT = 316 )

(d) What are rocket propellants? Enumerate characteristics of good propellants.

What is specific impulse; give equation. **7**

**OR**

Describe the classification of propellants. **7**

**Applied Chemistry question paper**

**Examination, (Nov. Dec., (2013**)

**Maximum marks: 80**

**Minimum pass marks: 28**

Note: (i) All units are compulsory.

Question no. 1 is compulsory. Attempt any 2 questions from question number

2, 3 and 4.

**2**

Q.1. Calogon is:

(a) Na2PO4

(b) NaCl

(c) (Na2PO3)6

(d) (NaH2PO4)

Q.2. Kharun river water sample on analysis gave the following data: **7**

CO2 = 24mg/l, Ca ++ = 30 mg/L, Mg++ = 24 Mg/L,

HCl = 50 Mg/L, K+ = 10MgL, SiO2 + 20mg/L

Calculate the quantities of Lime (93% pure) and Soda (82%pure ) required to soften

50, 000 liters of water sample

**Q. 3.** Alkalinity of water cannot be due to the simultaneous presence of OH- CO3—and HCO3 - **7**

Give reason.

250 ml water sample required 4 ml of N/50 H2SO~~4~~ for neutralization to phenolphthalein end – point another 16ml of the same acid was needed for further titration to methyl orange end point.

**Q. 4.** Wright principle & draw neet diagram of ion exchange process. 7

**Unit – II**

**Q. 1.**  The quality of diesel fuel depends on: **2**

1. Octane Number
2. Gold Number
3. Steam Number
4. Cetane Number

**Q. 2.**  What do you mean by carbonization of coal?

Explain this process with labeled diagram of Otto –Hoffmann’s by product Oven method. **7**

**Q.3**  the percentage composition by weight of a sample of coal was found to be as under: **7**

C = 81%, H = 5%, O = 8.5%, A = 1%, N = 1% and ash = 3.5%

1. Calculation the minimum amount of oxygen and air required for complete combustion of 1 kg of the coal.
2. Percentage composition by weight of the dry products of combustion.

Q. 4. Attempt any two:

(a) Kjeldahal’s method for determination of nitrogen

(b) Octane no and Cetane no.

© Calculate Gross and Net calorific value of the coal sample having the following composition:

C = 80% , H = 7% , O = 3% S = 3.5% , N = 2.1% and ash = 4.4%

**Unit – III**

**Q. 1.**  The formula of yellow rust is: **2**

(a) Fe2O2H2O

(b) Fe3O4

© FeSO4

1. Cu (OH)2

**Q. 2.** Define corrosion Explain all mechanism of electro chemical theory of corrosion by taking

Example rusting of iron. **7**

**Q. 3.**  What is the difference between primary cell and secondary cell? Write changing and discharging reaction of lead acid storage battery. What are the major drawbacks of lead acid storage cell? **7**

**Q. 4.**  Write information note with suitable chemical reaction on any two: **7**

**(a)**  Microbiological corrosion

(b) Solar cell

© Application of protective coating for prevention of corrosion.

**Unit – IV**

**Q. 1.**  Gypsum retards initial setting time of cement by forming compound: **2**

1. Dicalcium sulphoaliminate
2. Tricalcium sulphoaluminate
3. Tobermonite gel
4. Hydrated tricalcium aluminoferrite

**Q. 3.** Discuss the preparation. Properties and uses of the phenol formaldehyde resin. **7**

Also write which type of resin is this?

**Q. 4.**  Write notes on any two:  **7**

**(a)**  Neat and labeled diagram of Rotary Kiln

(b) Difference between thermoplastic and thermosetting resins

© Extreme pressure lubrication

**Unit – V**

**Q. 1.**  Tropex is a misture of: **2**

1. TNT + RDX
2. Al + TNT + RDX
3. Al + TNT + NH4No3
4. TNT + RDX + Dynamite

**Q. 2.** Define Oxygen balance. Write formula of it. Calculate oxygen balance for tri nitro Toluene

And ammonium nitrate. **7**

**Q. 3.**  What is the principle of rocket propellant? Give classification of propellant with **7**

Suitable example.

**Q. 4.**  Write preparation, properties and uses along with suitable flow chart of any two chemicals. **7**

1. Carbon Tetra Chloride
2. Benzene
3. Ammonium Sulphate
4. Calcium phosphate

**Applied Chemistry question paper**

**Examination, (April – May) ., (2013**)

**Maximum marks: 80**

**Minimum pass marks: 28**

1. All the question are compulsory.
2. (a) Part of each question is compulsory. Only two parts from each unit having (b), (c) and (d) must be at temped.

Q. 1. (a) Define alkalinity of water.

(b) (i) Give chemical formulae of three permanent hardness producing compounds.

(ii) Numerical: Calculate the amount of lime (80% pure) and soda (75% pure) required for

Softening of 20,000 liters of water whose analysis is as follows:

Ca (HCO3)2 = 40.5 ppm , CaSo4 = 34.0 ppm , Mg (HCO3)2 = 36.5ppm , CaCl2 = 27.75 ppm ,

MgSO4 = 30.0 ppm, and NaCl = 10.0 ppm .

(Molecular Wt. of Ca (HCO3)2 = 162, CaSO4 = 136 , Mg(HCO3)2 = 146 CaCl2 = 111,

MgSO4 = 120, & NaCl = 58.5)

© (i) why removal of gases from boiler feed water is necessary. Give reason only.  **4**

1. Sketch a labeled diagram of ion exchange method of water softening.  **3**
2. Write short notes on any two of the following. **3 ½ + 3 ½**
3. Phosphate conditioning
4. Disadvantages of Zeolite process of water softening
5. Scale & sludge

Q. 2. (a) Define Combustion.

(b) (i) Give in brief the difference between proximate and ultimate analysis.

(ii) In a bomb calorimeter the temperature of 950 gms of water increase from 25.5oC to 28.5oC on burning 0.75gm of solid fuel. Water equivalent of calorimeter is 400 gm and latent heat of steam is 587 cal / gm. if the fuel has 0.65% of Hydrogen, calculate its net calorific value. **4**

© Give Otto Hoffman process of manufacturing of Coke. **7**

1. Write short notes on any Two of the following :  **3 ½ + 3 ½**
2. Cetane number
3. Power alcohol
4. Carbonization of coal

**Unit - 3**

Q. 3. (a) What is Battery? **2**

(b) Explain Differential Aeration Corrosion with two examples. (Along with figure). **7**

© Explain with at least three figures how corrosion can be controlled by making

Different in the shapes of article.  **7**

1. Write short notes on any two of the following : **7**
2. Fuel cell
3. Secondary

**Unit - 4**

**Q. 4 (a)** Define Natural Polymers.  **2**

(b) (i) give important applications of Lubricants . **3**

(ii) Name raw materials for the manufacture for port land cement.  **2**

1. What is the role of Gypsum in the setting of cement? **2**

© Give a labeled diagram of wet method of manufacture for Portland cement.

Give occurring reaction also. **7**

1. Write short notes on any on any two of the following : **3 ½ + 3 ½**
2. Bakelite
3. Hydrodynamic Lubrication
4. Differences between thermosetting and thermoplastic resins.

**Unit – 4**

**Q. 5 (a)** Define Explosive?

(b) Write a method of preparation and industrial uses of any two of the following: **3 ½ + 3 ½**

(i) Cellulose Acetate

(ii) Ammonium Nitrate

1. Chloroform

© Give characteristic of an explosive.  **7**

1. Write short notes on any two of the following : **3 ½ + 3 ½**

1. Ethyl Alcohol
2. Acrilonitrile
3. High Explosive