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Total No. of Printed Pages—8

**6 SEM TDC CHM M 3 (N/O)**

**2 0 1 8**

( May )

**CHEMISTRY**

( Major )

Course : 603

**( Inorganic Chemistry—III )**

*The figures in the margin indicate full marks  
for the questions*

( New Course )

Full Marks : 48

Pass Marks : 14

Time : 2 hours

1. Choose the correct answer : 1×5=5

(a) Non-heme iron protein is

- (i) hemoglobin
- (ii) myoglobin
- (iii) hemerythrin
- (iv) cytochrome P-450

(b) The function of plastocyanin is

- (i) oxidation of L-ascorbic acid
- (ii) electron transfer in plants
- (iii) oxidation of primary amine
- (iv) oxygen transport

- (c) The formula of kaolinite clay is
- (i)  $\text{Al}_2\text{O}_3 \cdot \text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$
  - (ii)  $\text{Al}_2\text{O}_3 \cdot \text{Na}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$
  - (iii)  $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$
  - (iv)  $\text{Al}(\text{OH})_3 \cdot \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- (d) Paper chromatography is more suited to
- (i) partition
  - (ii) molecular sieving
  - (iii) ion exchange
  - (iv) adsorption
- (e) In 1952, the 'Minamata' disease in Japan was caused by poisoning effect of
- (i) Pb
  - (ii) Cd
  - (iii) Hg
  - (iv) As

UNIT—I

2. (a) Answer any *three* questions : 4×3=12
- (i) Describe the role of copper in biological system. 4
  - (ii) What are the functions of hemoglobin and myoglobin? What are the principal similarities in their structures? 3+1=4
  - (iii) What is carboplatin? Give one of its uses. What are its advantages over those of *cis-platin*? 1+1+2=4

- (iv) Explain one function of each of the following metals in biological system :  $2 \times 2 = 4$
- (1) Molybdenum
  - (2) Magnesium
- (b) Write a note on any one of the following : 2
- (i) Nitrogenase
  - (ii) Chelation therapy

UNIT—II

3. (a) Answer any three questions :  $3 \times 3 = 9$
- (i) Discuss about the advantages of solid-state reaction with the help of two examples. 3
  - (ii) What are the supramolecular interactions? Give two examples. 3
  - (iii) Mention the two basic approaches for synthesis of nanomaterials. Name the two characterization techniques for nanomaterials.  $1\frac{1}{2} + 1\frac{1}{2} = 3$
  - (iv) What are clay minerals? Give the formula and uses of montmorillonite clay.  $1 + 2 = 3$
- (b) Mention two applications of nanomaterials. 2

UNIT—III

4. (a) Describe the principle and application of paper chromatography. 3

Or

Define the terms 'stationary phase' and 'mobile phase' in chromatographic process. Name the phases used in TLC.

2+1=3

- (b) Write a short note on any *one* of the following : 2
- (i) Principles of gas chromatography
  - (ii) Advantages of TLC over paper chromatography

UNIT—IV

5. (a) Answer any *three* questions : 3×3=9
- (i) What do you mean by setting of cement? Write down the reactions involved in it. 1+2=3
  - (ii) What are paints? Mention the names of essential parts of a paint. What is the role of a binder? 1+1+1=3
  - (iii) What is demineralized water? Describe a method of demineralization of water. 1+2=3
  - (iv) Discuss the poisoning effect of mercury (Hg) on human body. 3

(b) Write short notes on any *two* of the following : 2×2=4

- (i) Glazing compounds of ceramics
- (ii) Role of thinner in paint industry
- (iii) Hazard from radioactive fallout
- (iv) Composition of cement

( Old Course )

Full Marks : 48

Pass Marks : 19

Time : 3 hours

1. Choose the correct answer : 1×5=5

(a) Which of the following enzymes do not have heme group?

- (i) Hemoglobin
- (ii) Ferredoxin
- (iii) Cytochrome oxidase
- (iv) Catalase

(b) Which vitamin is known as cyanocobalamin?

- (i) B<sub>6</sub>
- (ii) B<sub>12</sub>
- (iii) K
- (iv) C

- (c) Which technique is used for the characterization of nanomaterials?
- (i) SEM
  - (ii) AFM
  - (iii) XRD
  - (iv) All of the above
- (d) The stationary phase in adsorption chromatography is
- (i) liquid
  - (ii) solid
  - (iii) gas
  - (iv) colloid
- (e) Minamata disease is caused by poisoning of
- (i) Pb
  - (ii) Hg
  - (iii) Cd
  - (iv) As

UNIT—I

2. Answer any *three* questions : 2×3=6
- (a) What is plastocyanin? Mention its function in plant body. 1+1=2
- (b) How does myoglobin help in oxygen storage and transport? 2
- (c) Write a note on nitrogen fixation. 2
- (d) Mention the function of Zn in biological system. 2

3. (a) Explain the role of Na and K in biological system. 3

(b) Write short notes on any two of the following :  $2\frac{1}{2} \times 2 = 5$

(i) Chelation therapy

(ii) Metalloenzyme

(iii) Vitamin B<sub>12</sub>

UNIT—II

4. Answer any three questions :  $3 \times 3 = 9$

(a) What do you mean by non-covalent interactions? Give two examples.  $1 + 2 = 3$

(b) How are nanomaterials classified? Give examples. 3

(c) What are clay minerals? Mention the typical formula of kaolinite clay and its one application.  $1 + 1 + 1 = 3$

(d) How is solid-state reaction more advantageous over other conventional routes? Give one example.  $2 + 1 = 3$

UNIT—III

5. Answer the following questions :  $3 \times 3 = 9$

(a) What are 'stationary phase' and 'mobile phase' in chromatographic process? Name the phases used in column chromatography.  $1 + 2 = 3$

( Turn Over )

( 8 )

- (b) What kind of information do you get from AAS? Give examples of one auxochrome and one chromophore.  $1+2=3$
- (c) Describe the technique adopted in paper chromatography. How TLC has more advantage over paper chromatography? What is FTIR?  $1+1+1=3$

Or

Write notes on the following :  $1\frac{1}{2}\times 2=3$ 

- (i) Thin-layer chromatography
- (ii) Molecular fluorescence spectroscopy

## UNIT—IV

6. Answer the following questions :

- (a) Name three important constituents of paints. Write about the coloured pigments used in paint industry.  $1\frac{1}{2}+1\frac{1}{2}=3$
- (b) What are the basic raw materials used for the manufacture of cement? Write the composition of Portland cement. Mention the role of gypsum in cement industry.  $1+1+1=3$
- (c) Write short notes on any two of the following :  $2\frac{1}{2}\times 2=5$
- (i) Principle of green chemistry
- (ii) Pb poisoning
- (iii) Hazard from radioactive fallout

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Total No. of Printed Pages—10

**6 SEM TDC CHM M 3 (N/O)**

**2017**

( May )

**CHEMISTRY**

( Major )

Course : 603

**( Inorganic Chemistry—III )**

*The figures in the margin indicate full marks  
for the questions*

( New Course )

Full Marks : 48

Pass Marks : 14

Time : 2 hours

1. Select the correct answer :

1×5=5

(a) Hemocyanin contains

(i) magnesium

(ii) iron

(iii) copper

(iv) zinc

(b) The DNA and RNA helices are stabilized by

- (i)  $Mg^{2+}$
- (ii)  $Fe^{2+}$
- (iii)  $Ca^{2+}$
- (iv)  $Cu^{2+}$

(c) Which of the following materials is not used as binders in TLC?

- (i) Plaster of Paris
- (ii) Starch
- (iii) Silica gel
- (iv) All of the above

(d) Which of the following is used to decolourise and deodorize vegetable and mineral oils?

- (i) Kaolinite
- (ii) Montmorillonite
- (iii) Laponite
- (iv) None of the above

(e) Which of the following belongs to ceramics?

- (i) Earthen ware
- (ii) Porcelain
- (iii) Tera cotta
- (iv) All of the above

UNIT—I

2. (a) Answer any *three* questions :
- (i) What is carbonic anhydrase? Discuss its activity in living organism. 4
  - (ii) Discuss the role of sodium and potassium in biological process. 4
  - (iii) What is hemoglobin? Discuss its main functions. 4
  - (iv) Explain how metal poisoning can be treated by chelation therapy. 4
- (b) Write a note on any *one* of the following : 2
- (i) *cis-platin*
  - (ii) Plastocyanin

UNIT—II

3. Answer any *three* questions : 3×3=9
- (a) What do you mean by non-covalent interaction? Mention the name of any two types with examples. 1+2=3
  - (b) What are the advantages of nano-materials in modern science? Mention two applications of nano-materials. 3

- (c) What do you mean by step-up and step-down syntheses of nano-materials? Name one method which follows step-down procedure. 2+1=
- (d) What do you mean by composite materials? Write a note on the application of nano-composite material. 1+2=

UNIT—III

4. Answer any *three* questions : 3×3=

(a) Describe the principle and application of thin-layer chromatography. 3

(b) Apply paper chromatography to separate a mixture of amino acids. How is  $R_f$  value calculated and what information is obtained from this value? 3

What is FTIR? What kind of information do you get from it? 3

Write the principle behind atomic absorption spectroscopy. Give its two applications. 1+2=3

(e) Write short notes on the following : 1½+1½=3

(i) Choice of solvent system in chromatography

(ii) Principles of column chromatography

UNIT—IV

5. Answer the following questions :

- (a) What is Portland cement? How is it manufactured industrially? 1+3=4
- (b) Discuss the health hazards which may be caused by mercury and its compounds. 4

Or

What are the hazards associated with nuclear accident? 4

- (c) Write short notes on any *two* of the following : 1½×2=3
- (i) Role of binder and solvent in paint industry
- (ii) Ceramics
- (iii) Classification of paints

( Old Course )

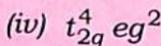
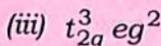
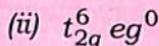
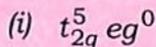
Full Marks : 48

Pass Marks : 19

Time : 3 hours

1. Select the correct answer : 1×5=5

(a) The electron configuration of Fe in oxyhemoglobin is



(b) Which of the following contains molybdenum?

(i) Aldehyde oxidase

(ii) Ceruloplasmin

(iii) Amine oxidase

(iv) None of the above

(c) Which of the following is not a clay mineral?

(i) Benitoite

(ii) Laponite

(iii) Bentonite

(iv) Kaolinite

( 6 )

( Old Course )

Full Marks : 48

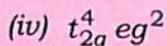
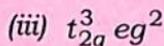
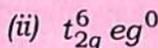
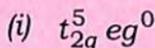
Pass Marks : 19

Time : 3 hours

1. Select the correct answer :

1×5=5

(a) The electron configuration of Fe in oxyhemoglobin is



(b) Which of the following contains molybdenum?

(i) Aldehyde oxidase

(ii) Ceruloplasmin

(iii) Amine oxidase

(iv) None of the above

(c) Which of the following is not a clay mineral?

(i) Benitoite

(ii) Laponite

(iii) Bentonite

(iv) Kaolinite

( Continued

- (d) In fluorescence spectroscopy, the emitted radiation has
- (i) a shorter wavelength
  - (ii) a longer wavelength
  - (iii) high energy per photon
  - (iv) None of the above
- (e) Demineralized water is obtained by
- (i) Clark's process
  - (ii) permutit process
  - (iii) ion-exchange process
  - (iv) ozonisation

UNIT—I

2. (a) Answer any *three* questions :

- (i) Describe the role of zinc in human body. 4
- (ii) What are the functions of hemoglobin and myoglobin? What are the principal similarities in their structures? 3+1=4
- (iii) Explain the role of alkali and alkaline earth metals in biological system. 4

- (iv) Write short notes on any *two* of the following : 2×2=4
- (1) Chelation therapy
  - (2) Nitrogenase
  - (3) Cyanocobalamin
- (b) Give the name of any two copper enzymes and mention one function of each. 2

UNIT—II

3. Answer any *three* questions : 3×3=9

- (a) What do you mean by supramolecular interaction? How is it different from covalent interaction? Give one example. 1+1+1=3
- (b) What is isomorphous replacement in clay minerals? Give the general formula of kaolinite clay. Mention its one application. 1+1+1=3
- (c) Write a note on polymer nanocomposite material. 3
- (d) Name two basic approaches for synthesis of nanomaterials. Mention the name of any two characterization techniques for them. 2+1=3
- (e) Discuss about the advantage and application of solid-state reaction. 3

UNIT—III

4. Answer any *three* questions : 3×3=9
- (a) Describe the principle and application of thin-layer chromatography. 3
  - (b) What is FTIR? What kind of information do you get from it? 3
  - (c) Apply paper chromatography to separate a mixture of amino acids. How is  $R_f$  value calculated and what information is obtained from it? 3
  - (d) Write short notes on any *two* of the following : 1½×2=3
    - (i) Choice of solvent system in chromatography
    - (ii) Principles of column chromatography
    - (iii) Atomic absorption spectroscopy

UNIT—IV

5. Answer the following questions :

(a) Mention two sources through which lead can enter human body. Discuss the poisoning effect of lead. (A1) 1+3=4

Or

What are the hazards associated with nuclear accident? 4

( 10 )

- (b) What is Portland cement? How is it manufactured industrially?  $1+3=4$
- (c) Write short notes on any *two* of the following :  $1\frac{1}{2}\times 2=3$
- (i) Role of binder and solvent in paint industry
  - (ii) Ceramics
  - (iii) Classification of paints

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Total No. of Printed Pages—6

**6 SEM TDC CHM M 3**

**2016**

( May )

**CHEMISTRY**

( Major )

Course : 603

**( Inorganic Chemistry—III )**

Full Marks : 48

Pass Marks : 19

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

- ①. Select the correct answer : 1×5=5
- (a) The variation of oxygen affinity of hemoglobin and myoglobin with pH of medium is known as
- (i) cooperativity
  - (ii) Halden effect
  - ✓(iii) Bohr effect
  - (iv) trigger mechanism

(b) The function of plastocyanin is

- (i) electron transfer in plants
- (ii) oxygen transport
- (iii) oxidation of L-ascorbic acid
- (iv) oxidation of amine

(c) Paper chromatography may be regarded as

- (i) solid-liquid partition chromatography
- (ii) liquid-liquid partition chromatography
- (iii) solid-liquid adsorption chromatography
- (iv) None of the above

(d) In the manufacture of cement, cement clinker is mixed with 2-3% gypsum because gypsum

- (i) helps quick setting
- (ii) slows down setting of cement
- (iii) removes impurity
- (iv) increases the amount of cement

(e) Which of the following is a secondary interaction?

- (i) Ionic bond
- (ii) Covalent bond
- (iii) Dative bond
- ✓(iv) Hydrogen bond

UNIT—I

2. (a) What are vitamin B<sub>12</sub> and vitamin B<sub>12</sub> coenzyme? What metal is present there? What are the oxidation states of the metal in vitamin B<sub>12</sub>? 2+1+1=4

Or

(i) What is an enzyme? Write a note on copper enzymes. 4

(b) Write a short note on the role of iron in oxygen storage and transport in biological system. 4

(c) What is carboplatin? What are its advantages over those of cis-platin? 1+2=3

(d) Discuss the role of metal ions in biological nitrogen fixation. 3

Or

What metal is present in carboxy-peptidase? What is its function? What will you get if the metal is removed and will it show enzyme activity as earlier? 3

UNIT—II

3. Answer any *three* questions :

- (a) What do you mean by secondary interaction? Mention two types of such interactions. 3
- (b) What are the basic approaches used to prepare nanomaterials? Give one advantage and one disadvantage for each synthesis. 3
- (c) Discuss about the advantages of solid state reaction with the help of two examples. 3
- (d) Give the formula of kaolinite and montmorillonite and mention their uses. 3

UNIT—III

4. Answer any *three* questions :

- Q. No. 4*  
*Comp. P.P.*  
*f*
- (a) What is atomic absorption spectroscopy? What kind of information do you get from atomic absorption spectroscopy? 3
- f* (b) Describe the technique adopted in paper chromatography. What are ascending and descending paper chromatography? 3
- (c) Write notes on :  $1\frac{1}{2} + 1\frac{1}{2} = 3$
- (i) Advantages of TLC over paper chromatography
- (ii) Preparation of plate in TLC
- (d) What is chromatography? Explain the elution method of recovery of pure constituents from the chromatogram in a column chromatography. 3
- (e) Write short notes on (any *two*) :  $1\frac{1}{2} \times 2 = 3$
- (i) Chromophores and auxochromes
- Q. No. 5*  
*Comp. P.P.*  
*f* (ii) Molecular fluorescence spectroscopy
- (iii)  $R_f$  values

UNIT—IV

5. (a) What are hydrolysis and hydration in setting of cement? 3
- (b) What are the constituents of paints? State the three types of pigments used in paint manufacture. 3

Or

What is lithopone? How is it prepared? Give its advantage over white lead. 3

- (c) Write short notes on (any two) :  $2\frac{1}{2} \times 2 = 5$
- (i) Poisoning effect of cadmium on human body
- (ii) Purification of industrial waste-water
- (iii) Manufacture of ceramics
- (iv) Principles of green chemistry

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$$\frac{40}{2} \times 2 = 20$$

Total No. of Printed Pages—5

6 SEM TDC CHM M 3

2015

( May )

CHEMISTRY

( Major )

Course : 603

( Inorganic )

Full Marks : 48

Pass Marks : 19

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. Choose the correct option :

1×5=5

*6/10* (a) Which of the following techniques is used for the characterization of nanoparticle?

(i) AAS

(ii) NMR

(iii) SEM

(iv) None of the above

(b) The stationary phase in adsorption chromatography is

- (i) liquid
- (ii) solid
- (iii) gas
- (iv) colloid

(mobile phase = liquid)

(c) Japanese itai-itai disease is caused by the poisoning of

- (i) Pb
- (ii) Hg
- (iii) Cd
- (iv) As

(d) The electron configuration of Fe in deoxy Mb is

- (i)  $t_{2g}^6 e_g^0$
- (ii)  $t_{2g}^4 e_g^2$
- (iii)  $t_{2g}^5 e_g^0$
- (iv)  $t_{2g}^3 e_g^2$

(e) Which of the following is not an oxygen carrier?

- (i) Haemoglobin
- (ii) Myoglobin
- (iii) Hemocyanin
- (iv) Hemerythrin

UNIT—I

2. (a) Define cooperativity effect and trigger mechanism in haemoglobin. 3
- (b) Explain the role of Na and K in biological system. 3
- (c) Discuss the activity of carbonic anhydrase in living organism. 2

Or

- (c) Write a note on the function of nitrogenase.
- (d) Mention the function of the following metal in biological system : 2  
Zn and Co
- (e) Write short notes on (any two) :  $2 \times 2 = 4$
- (i) Plastocyanin
  - (ii) Chelation therapy
  - (iii) Metalloenzyme

UNIT—II

3. (a) How are nanomaterials classified on the basis of dimension? Give example for each of them. 4

( 4 )

- (b) What is isomorphous substitution in clay minerals? Give example and write the formula for kaolinite clay.  $1+1+1=3$

Or

What do you mean by non-covalent interaction? Mention the name of any two types with examples.  $1+2=3$

- (c) Write a note on the application of polymer nanocomposite materials. 2

UNIT—III

4. Answer any *three* questions :  $3 \times 3 = 9$

(a) Define the terms 'stationary phase' and 'mobile phase' in chromatographic process. Name the phases used in TLC.  $2+1=3$

(b) What is the basic principle used to separate a mixture of two components with the help of column chromatography? Write the names of two eluting agents.  $2+1=3$

(c) Write the principle behind AAS. Give its two applications.  $1+2=3$

- (d) What kind of information do you get from FTIR? How does it differ from infrared spectroscopy?  $2+1=3$
- (e) How can a real sample be analyzed with the help of spectrochemical methods? Give one example only. 3

UNIT—IV

5. (a) What are the basic raw materials used for the manufacture of cement? Write the composition of Portland cement.  $1+1=2$
- (b) Discuss about the hazards associated with radioactive fallout. 2
- (c) How do Pb and Hg behave a toxicant? Explain with examples.  $1\frac{1}{2}+1\frac{1}{2}=3$
- (d) Write short notes on (any two) :  $2\times 2=4$
- (i) Classification of paint
  - (ii) Principle of Green chemistry
  - (iii) Ceramics

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Total No. of Printed Pages—6

6 SEM TDC CHM M 3

2014

( May )

CHEMISTRY

( Major )

Course : 603

( Inorganic Chemistry )

Full Marks : 48

Pass Marks : 19

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. Choose the correct option : 1×5=5

(a) Paper chromatography is more suited to

(i) adsorption

(ii) molecular sieving

(iii) partition

(iv) ion-exchange

(b) Anaemia is due to the deficiency of

(i) Fe

(ii) Zn

(iii) Na

(iv) K

(c) Which of the following ceramic products is mainly used as pigment in paints?

(i)  $\text{SiO}_2$

(ii)  $\text{TiO}_2$

(iii)  $\text{ZrO}_2$

(iv)  $\text{UO}_2$

(d) Which vitamin is known as cyanocobalamin?

(i) A

(ii)  $\text{B}_6$

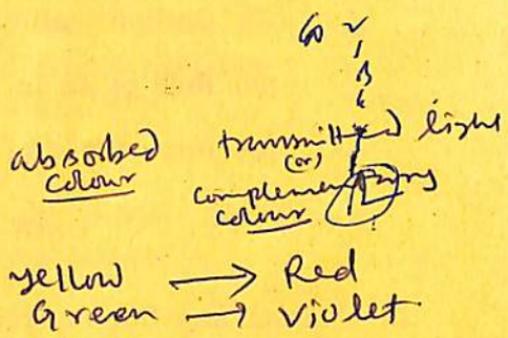
(iii)  $\text{B}_{12}$

(iv) C

old

The colour of the transmitted light, when yellow light is absorbed, is

- (i) yellow
- (ii) red
- (iii) blue
- (iv) green



UNIT-I

2. (a) What is plastocyanin? Give its functions in plant body. 1+1=2

(b) Name and discuss the biological importance of one metalloprotein containing Cu. 2

(c) What are picket-fence porphyrins? How do they help in oxygen transport? 1+2=3

Or

What is myoglobin? How does it help in oxygen transport? 1+2=3

(d) What is carboplatin? Mention its advantages over cisplatin. 1+2=3

(e) Write notes on (any two) :  $2 \times 2 = 4$

(i) Nitrogenase

(ii) Carbonic anhydrase

(iii) Role of Zn in human body

(iv) Importance of Ca for human body

UNIT—II

3. Answer any three questions :  $3 \times 3 = 9$

(a) What are supramolecular interactions?  
Give two examples. 3

(b) Mention the two basic approaches for  
synthesis of nanomaterials. Name two  
characterization techniques for  
nanomaterials.  $1\frac{1}{2} + 1\frac{1}{2} = 3$

(c) What are clay minerals? Give two  
examples and mention the typical  
formula of clay.  $1 + 1 + 1 = 3$

(d) Write a note on polymer nanocomposite  
materials. 3

(e) Discuss about the advantages of solid  
state reaction with the help of two  
examples. 3

UNIT—III

4. (a) Mention the basic principle used in chromatographic separation. Why is TLC more advantageous over paper and column chromatography?  $1+1=2$

(b) What are the basic parts present in a general spectrophotometer? 2

Or

What are chromophores and auxochromes? Give examples. 2

(c) What kind of information do you get from atomic absorption spectroscopy? How on the basis of  $R_f$  values, a mixture containing 3 components can be separated using paper chromatography?  $2+3=5$

Or

Write short notes on :  $2\frac{1}{2}\times 2=5$

(i) Gas chromatography

(ii) FTIR spectroscopy

UNIT—IV

- 4 copy
5. (a) What do you mean by setting of cement? Write down the reactions involved in it. 1+2=3
- (b) What are paints? Mention the names of essential parts of a paint. What is the role of a binder? 1+1+1=3
- (c) How does lead harm the human body? How can lead poisoning be prevented? 1½+1½=3

Or

Discuss the poisoning effect of Hg on human body. 3

- (d) State two principles of Green chemistry. 2

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