

**GOVERNMENT ZIRTIRI RESIDENTIAL SCIENCE COLLEGE**

**GEOLOGY & GEOCHEMISTRY**

**PETROLOGY**

**CORE COURSE: III**

**2<sup>nd</sup> SEMESTER**

A. Multiple choice questions:

(1X25=25)

**UNIT 1**

1. Magma associated with zones of subduction is

- (i) Granite
- (ii) Andesite
- (iii) Syenite
- (iv) Basalt

2. Magma having less than 55% Silica is

- (i) Basaltic magma
- (ii) Granitic magma
- (iii) Andesitic magma
- (iv) Basic magma

3. Igneous intrusions which spread parallel to the country rocks is

- (i) Dyke
- (ii) Sills
- (iii) Lopolith
- (iv) Batholith

4. The texture in which larger grains are surrounded by smaller grains is called?

- (i) Poikilitic texture
- (ii) Aphanitic texture
- (iii) Ophitic texture
- (iv) Porphyritic texture

5. The volcanic equivalent of Syenite is

- (i) Trachyte
- (ii) Granodiorite
- (iii) Diabase
- (iv) Komatite

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## UNIT 2

1. The process that describe the physical and chemical changes in sediments due to change in temperature and pressure is known as

- i) sedimentation
- ii) Lithification
- iii) Diagenesis
- iv) Assimilation

2. To classified a sedimentary structure as 'laminae', the thickness of each layer should be

- i) >1 cm
- ii) <1 cm
- iii) >2 cm
- iv) <2 cm

3. Which of the following is an example of clastic sedimentary rock?

- i) Chert
- ii) Limestone
- iii) Rock salt
- iv) Sandstone

4. Shale refers to a rock formed from

- i) Sand size materials
- ii) Plant remains
- iii) Clay minerals
- iv) Carbonates

5. Sedimentary rocks formed by accumulation of bigger rounded rock fragments such as grave, pebble and boulders are known as

- i) Conglomerate
- ii) Breccia
- iii) Sandstone
- iv) Limestone

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## UNIT 3

1. Progressive metamorphism of shale is in the order

- (i) Phyllite, schist, slate, gneiss
- (ii) Slate, phyllite, schist, gneiss
- (iii) Gneiss, schist, phyllite, slate
- (iv) Slate, phyllite, gneiss, schist

2. In cataclastic metamorphism the main agent is

- (i) Temperature
- (ii) Chemically active fluids
- (iii) Load pressure
- (iv) Directed pressure

3. The minimum temperature for metamorphism is

- (i) 400°C
- (ii) 50°C
- (iii) 100°C
- (iv) 200°C

4. In metamorphic facies hornfels are

- (i) Low temperature high pressure
- (ii) Low temperature low pressure
- (iii) High temperature low pressure
- (iv) High temperature high pressure

5. Marbles and quartzites are products of

- (i) Contact metamorphism
- (ii) Dynamic metamorphism
- (iii) Shock metamorphism
- (iv) Metasomatism

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## UNIT 4

1. All the elements and their isotopes are believed to have synthesized from the nuclei of
  - i) Hydrogen
  - ii) Helium
  - iii) Oxygen
  - iv) Nitrogen
2. Elements that is unsuitable in size and/or charge to the cation sites of the minerals of which it is included is known as
  - i) Compatible elements
  - ii) Incompatible elements
  - iii) Low field strength elements
  - iv) High field strength elements
3. Which is the most correct sequence of the elemental abundance in the earth?
  - i) O>Si>Mg>Fe>Ca
  - ii) O>Si>Al>Mg>Ca
  - iii) O>Si>Mg>Al>Fe
  - iv) O>Si>Fe>Al>Ca
4. The average concentration of elements in the earth's crust are called
  - i) Partition coefficient
  - ii) Clarke value
  - iii) Background value
  - iv) Crustal rock forming elements
5. A relatively mobile element or gas that occurs in close association with an element or commodity being sought and can be used in indicating the potential of certain rocks to contain ore minerals are known as
  - i) Pathfinder elements
  - ii) Trace elements
  - iii) Compatible elements
  - iv) Incompatible elements

## UNIT 5

1. Press pellets of a sample with boric acid is required in
  - i) XRF
  - ii) XRD
  - iii) ICP-MS
  - iv) SEM
2. Which of the following instruments produce very high resolution images of a sample revealing details less than 1 mm.
  - i) XRF

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- ii) XRD
  - iii) SEM
  - iv) ICP-MS
3. For constructive interference in Bragg's law,  $n\lambda$  equals
- i)  $2d \cos^2 \theta$
  - ii)  $2d \cos \theta$
  - iii)  $2d \sin^2 \theta$
  - iv)  $2d \sin \theta$
4. In SEM, to produce an image, various types of signals include secondary electron, cathodoluminescence, absorbed current, transmitted electron and
- i) Back scattered electron
  - ii) Excited electron
  - iii) Visible light
  - iv) Infra red
5. Determination of thickness and elemental composition from nm to mm thick layers in stratified materials is possible in
- i) ICP-MA
  - ii) Electron Microprobe
  - iii) AAS
  - iv) XRF

### B. Fill in the blanks:

#### UNIT 1

1. If magma crystallizes before it reaches the surface it will form an igneous rock at depth called a \_\_\_\_\_ or intrusive igneous rock.
2. In the Bowen's reaction series, when minerals react with the remaining melt to form new minerals it is called the \_\_\_\_\_ reaction series.
3. Dunite is an ultramafic igneous rock which is almost entirely composed of the mineral \_\_\_\_\_.

#### UNIT 2

1. Sedimentary rocks having a grain size ranging from 1/16 mm to 2 mm is known as \_\_\_\_\_ [Boulders/ Pebbles/ Cobbles/ Sandstone]
2. In \_\_\_\_\_ each bed shows a gradation in grain size from coarse below to fine above. [Bedding plane/lamination/ Graded bedding/ Heterolithic bedding]

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3. The wavy undulations seen on the surface of bedding planes, produced by the action of wave and currents in shallow water is known as \_\_\_\_\_. [Trough cross bedding/ Ripples/ Wavy bedding/ Lenticular bedding]
4. A sandstone containing <15% matrix and >25% feldspar is classified as \_\_\_\_\_. [Quartz arenite/ Quartz wacke/ Arkosic arenite/ Arkosic wacke]
5. Sedimentary rocks formed by chemically or organically and which often contains fossils is \_\_\_\_\_. [Breccia/ Conglomerate/ Shale/ Limestone]

### UNIT 3

1. In metamorphism the original rock that has undergone metamorphism is called the \_\_\_\_\_.
2. Since only a small area surrounding the intrusion is heated by the magma, metamorphism is restricted to a zone surrounding the intrusion, called a \_\_\_\_\_.
3. The \_\_\_\_\_ textures are those which retain the original texture of the preexisting rock and are denoted as the equivalent igneous texture with a prefix "*blasto*".

### UNIT-4

1. Elements having a strong affinity for silicates are known as \_\_\_\_\_. [Siderophile/Chalcophile/Atmophile/Lithophile]
2. The products of decomposition of rock, and also in soil, water, plants, and the surface atmosphere as a result of supergene processes taking place on the land surface results in the zone of increased \_\_\_\_\_ within the earth's surface. [Primary halos of dispersion/ Secondary halos of dispersion/ fan dispersion/ train dispersion]
3. \_\_\_\_\_ are the elements that are not stoichiometric constituents in phase in the system of interest. [Pathfinder elements/ Trace elements/ Rare earth elements/ Chondrite normalized REE]
4. \_\_\_\_\_ relate the amount of a trace element that enters a growing crystal to the amount of that element in the coexisting fluid. [Background value/ Threshold value/ Clarke value/ Partition coefficients]

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5. The capability of an atom or ion (charged atom) to replace one another in a particular crystal lattice is known as \_\_\_\_\_. [Ionic bond/ Covalent bond/ Metallic bond/ Diadochic replacement].

### **UNIT 5**

1. The process of detecting and analyzing the emitted x-ray by an element is called \_\_\_\_\_ [x-ray diffraction/ x-ray fluorescence analysis/x-ray emission/x-ray detection]
2. The instrument \_\_\_\_\_ can identify clay rich minerals which can prevent big landslides and mudflow. [XRD/ ICP-MS/AAS/XRF]
3. In ICP-MS, the main purpose of the spray chamber is to ensure that only the \_\_\_\_\_ droplets produce by the nebulizer reach the plasma. [bulk/finest/partial]
4. Electron microprobe provides much better results than standard SEM/EDS because of the internal properties of \_\_\_\_\_.
5. The electron beam in Scanning Electron Microscope is scanned in a \_\_\_\_\_ pattern, and the position of the beam is combined with the intensity of the detected signal to produce an image.

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Answer Key:

**A.**

## **Unit 1**

- 1)- ii
- 2)- i
- 3)- ii
- 4)- iv
- 5)- i

## **Unit 2**

- 1)- iii
- 2)- ii
- 3)- iv
- 4)- iii
- 5)- i

## **Unit 3**

- 1)- ii
- 2)- iv
- 3)- iv
- 4)- iii
- 5)- i

## **Unit 4**

- 1)- i
- 2)- ii
- 3)-iii
- 4)- ii
- 5)- i

## **UNIT 5**

- 1)- i
- 2)- iii
- 3)- iv
- 4)- i
- 5)- ii

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## **B.**

### **Unit 1**

1. Plutonic
2. Discontinuous
3. Olivine

### **Unit 2**

1. Sandstone
2. Graded bedding
3. Ripples
4. Arkosic wacke
5. Limestone

### **Unit 3**

1. Protolith
2. Metamorphic aureole
3. Palimpsest

### **UNIT 4**

1. Lithophile
2. Secondary halos of dispersion
3. Trace elements
4. Partition coefficients
5. Diadochic replacement

### **UNIT 5**

1. x-ray fluorescence analysis
2. XRD
3. Finest
4. Wavelength Dispersive Spectroscopy
5. Raster