## Botany - Section A

1 Given below are two statements:
Presence of pneumatophores are
Assertion (A): morphological adaptive strategies of marshy plants

Reason (R):
Pneumatophores are modified adventitious roots for gaseous exchange

Both $(\mathbf{A})$ and $(\mathbf{R})$ are true and $(\mathbf{R})$ is the correct explanation of (A).
2. Both (A) and (R) are true but (R) is not the correct explanation of (A).
3. (A) is true but ( $\mathbf{R}$ ) is false.
4. Both (A) and (R) are false.

2 Given below are two statements:

| Assertion (A): | Long distance flow of photosynthates in <br> plants occurs through sieve tubes |
| :--- | :--- |
| Reason (R): | A mature sieve tube has peripheral layer <br> of cytoplasm without any nucleus |

1. Both (A) and (R) are true and (R) is the correct ${ }^{1 .}$ explanation of (A).
2. Both (A) and (R) are true but $(\mathbf{R})$ is not the correct
3. explanation of (A).
4. (A) is true but $(\mathbf{R})$ is false.
5. Both (A) and (R) are false.

3 Axile placentation is observed in:

1. China rose, Petunia and Lemon
2. Mustard, Cucumber and Primrose
3. Chine rose, Beans and Lupin
4. Tomato, Dianthus and Pea

4 What is true regarding aleurone layer in a monocot seed?
I. It is composed of proteinaceous material.
II. It is the outermost cell layer of the endosperm.

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

Identify the correct set of statements:
The leaflets are modified into pointed hard thorns in a. Citrus and Bougainvillea.
b. Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin.
Stem is flattened and fleshy in Opuntia and modified c. to perform the function of leaves.
${ }_{d}$ Rhizophora shows vertically upward growing roots that help to get oxygen for respiration.
Subaerially growing stems in grasses and strawberry
e. help in vegetative propagation.

Choose the correct answer from the options given below:

1. (a), (b), (d), and (e) only
2. (b), (c) only
3. (a), (d) only
4. (b), (c), (d) and (e) only

6 Consider the following statements about dicot leaf:
The epidermis which covers both the upper surface
I: (adaxial epidermis) and lower surface (abaxial epidermis) of the leaf has a conspicuous cuticle.
II: More stomata present on upper surface.
III: Mesophyll is differentiated into palisade and spongy parenchyma.
Which of the above statements are true?

1. I and II only
2. I and III only
3. II and III only
4. I, II and III

7 Stem tendrils are found in all the following plants except:

1. Peas
2. Cucumbers
3. Pumpkin
4. Watermelon

8 What will happen if the main axis of the shoot terminates into a flower?

1. Solitary flower will be produced
2. Flowers will be arranged in acropetal succession
3. Flowers arrangement would be racemose
4. The older flowers would be at the base

9 Consider the following statements:

I: Gymnosperms lack sieve tubes and companion cells
II: Phloem parenchyma is absent in most of the monocotyledons
III: Phloem fibres [bast fibres] are generally absent in the primary phloem

1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

10 Which of the following is not an anatomical feature of a dicot stem?

1. Hypodermis of collenchyma
2. Endodermis, also called the starch sheath
3. Pericycle semilunar patches of sclerenchyma
4. Vascular bundle - conjoint and closed

11 Identify the correct statement regarding the stem morphology from the following:
I: Stems bear only axillary buds.
II: Axillary buds may get modified into thorns as in Citrus
III: Stem tendrils develop from axillary buds as in gourds.

1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

12 Consider the following statements:
I. Whorled phyllotaxy is seen in Alstonia.

II Flowers of mustard, datura and chilli are actinomorphic.
III. The ovary in plum, peach and rose is epigynous.

Which of the above statements are true?

1. I and II only
2. I and III only
3. II and III only
4. I, II and III

13 Identify the incorrect statement:

1. Gymnosperms lack vessels in their xylem
2. In stem, arrangement of xylem is exarch and it is
3. endarch in root
4. Gymnosperms lack sieve tubes and companion cells in their phloem
5. Bast fibres are genrally absent in the primary phloem

14 Which of the following is/are function/s of a root?

1. Fixation of plants to the soil
2. Absorption of water and minerals
3. Storage of food
4. All of the above

15 Which of the following cell type of vascular tissue system of plants is not correctly matched with its function?

| Cell type | Function |  |
| :--- | :--- | :--- |
| 1. | Tracheid | Chief water conduction element in <br> gymnosperms |
| 2. | Vessel element | Chief water conduction element in <br> angiosperms |
| 3. | Sieve cell | Food conduction element in <br> angiosperms |
| 4. | Albuminous <br> cell | Delivery of substances to sieve cells |

16 In Bougainvillea thorns are the modifications of:

1. Adventitious root
2. Stem
3. Leaf
4. Stipules

17 Select the plant that is characterized with the presence of
A. Monadelphous stamen
B. Axile placentation
C. Alternate phyllotaxy
D. Superior ovary
E. Twisted aestivation

1. Pea
2. Argemone
3. China rose
4. Mustard

18 Cells which are much thickened at the corners due to a deposition of cellulose, hemi-cellulose and pectin and provide mechanical support to young stems are:

1. Parenchyma
2. Collenchyma
3. Sclereids
4. Sclerenchyma fibres

19 Identify the correct statements related to the androecium in the flower.
a. The sterile stamens are called staminodes
b. When stamens are attached to petals they are called epipetalous
c. Monadelphy is seen in China-rose
d. Polyadelphy is seen in Pea

- Variation in the length of anther filaments is seen in
e. Mustard

Choose the correct answer from the options given below:

1. (a), (c), (d) and (e) only
2. (a) , (b), (c) and (e) only
3. (a), (b) and (c) only
4. (b) , (c) and (d) only

20 Given below are two statements:

| Assertion (A): | The rhizome of ginger have nodes and <br> internodes |
| :--- | :--- |
| Reason (R): | Rhizome of ginger is an underground <br> modified stem |

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true but (R) is not the correct explanation of (A).
3. (A) is true but ( $\mathbf{R}$ ) is false.
4. Both (A) and (R) are false.

21 Identify the incorrect statement

1. Tap root develops from the radicle of the seed
2. The main function of the tap root system is food
${ }^{2 .}$ storage
3. The tap root system is usually found in monocots
4. The root that develops from the radicle is called as 4. primary root

22
In a comparative study of Acacia and Euphorbia, it is found that different structures perform photosynthesis. Which of the following structures helps in performing photosynthesis in Acacia and Euphorbia, respectively?

1. Stem modification and petiole modification
2. Root modification and stem modification
3. Root modification and petiole modification
4. Petiole modification and stem modification

23 Match each item in Column I with one item in Column II and chose your answer from the codes given below:
Column I (Flower) Column II (Position of the Ovary)

| I. Sunflower | 1. Epigynous |
| :--- | :--- |
| II. Mustard | 2. Hypogynous |
| III. Plum | 3. Perigynous |

Codes:

|  | I | II | III |
| :--- | :--- | :--- | :--- |
| 1. | 1 | 2 | 3 |
| 2. | 2 | 3 | 1 |
| 3. | 2 | 1 | 3 |
| 4. | 3 | 2 | 1 |

24 Adventitious roots that arise from branches of stem, hang downwards and later penetrate soil, are called as

1. Stilt root
2. Prop roots
3. Climbing roots
4. Buttress roots

25 Organ of perennation in potato is modified A $\qquad$ and organ for food storage in sweet potato is modified $\qquad$ B
Select the correct option to fill (A) and (B)

|  | A | B |
| :--- | :--- | :--- |
| 1. | Stem | Stem |
| 2. | Root | Root |
| 3. | Stem | Root |
| 4. | Root | Stem |

26 Match List-I with List-II

| List-I | LIst-II |
| :--- | :--- |
| (a) Imbricate | (i) Calotropis |
| (b) Valvate | (ii) Cassia |
| (c) Vexillary | (iii) Cotton |
| (d) Twisted | (iv) Bean |

Choose the correct answer from the options given below:

|  | (a) | (b) | (c) | (d) |
| :--- | :--- | :--- | :--- | :--- |
| 1. | (ii) | (i) | (iii) | (iv) |
| 2. | (ii) | (i) | (iv) | (iii) |
| 3. | (ii) | (iv) | (iii) | (i) |
| 4. | (i) | (iii) | (iv) | (ii) |

## NEET Level Test (29-Ост-23).

27 The Floral Diagram represents which one of the following families?


1. Fabaceae
2. Brassicaceae
3. Solanaceae
4. Liliaceae

28 The floral formula of Tomato/Tobacco is
1.

$$
\theta \mathcal{K}_{4-5} A_{10} B_{(2)}
$$

2. 

$$
\theta \mathrm{P}_{2} \mathrm{~A}_{3} \mathrm{C}_{1}
$$

3. 


4.


29 How many plants among China rose, Ocimum, sunflower, mustard, Alstonia, guava, Calotropis and Nerium (Oleander) have opposite phyllotaxy?

1. Three
2. Four
3. Five
4. Two

30 The roots that originate from the base of the stem are:

1. Primary roots
2. Prop roots
3. Lateral roots
4. Fibrous roots

31 In vexillary aestivation:

1. The standard overlaps the wings
2. The standard overlaps the keel
3. The standard is overlapped by keel
4. The keel overlap the wings

32 Given below are two statements:

| Assertion (A): | Leaves showing parallel venation are <br> found in monocotyledonous plants |
| :--- | :--- |
| Reason (R): | In leaves showing parallel venation, the <br> veins run parallel to one another, <br> veinlets are inconspicuous and <br> reticulations are absent |

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true but $(\mathbf{R})$ is not the correct explanation of (A).
3. (A) is true but ( $\mathbf{R}$ ) is false.
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are false.

33 The type of placentation shown in the given diagram is not seen in:


| 1. | Mustard | 2. | China rose |
| :--- | :--- | :--- | :--- |
| 3. | Tomato | 4. | Lemon |

34 Identify the correct features of Mango and Coconut fruits.
(i) In both, fruit is a drupe
(ii) Endocarp is edible in both
(iii) Mesocarp in Coconut is fibrous, and in Mango, it is fleshy
(iv) In both, the fruit develops from the monocarpellary ovary

Select the correct option from below:

1. (i), (iii) and (iv) only
2. (i), (ii) and (iii) only
3. (i) and (iv) only
4. (i) and (ii) only

35 Which one of the following statements is correct?

1. The seed in grasses is not endospermic
2. Mango is a parthenocarpic fruit
3. A proteinaceous aleurone layer is present in maize grain.
4. A sterile pistil is called a staminode.

## Botany - Section B

36 Which of the following is not a feature of a dicot root?

1. Absence of hypodermis.

Presence of uniseriate pericycle made up of 2. parenchyma.
3. Absence of conjuctive tissue and presence of pith
4. Presence of radial vascular bundles exhibiting tetrach condition with exarch xylem.

37 Water-impermeable layer in dicot roots is

1. Sclerenchymatous in nature
2. Innermost layer of cortex
3. Occupy the central portion
4. Present just below pericycle

38 The transverse section of a plant shows following anatomical features
a. Sclerenchymatous hypodermis
b. Scattered vascular bundles with peripheral smaller than centrally located ones
Water-containing cavities present within the vascular c. bundles

Identify the category of plants and its parts

1. Monocotyledonous stem
2. Dicotyledonous root
3. Monocotyledonous root
4. Dicotyledonous stem

39 Vascular bundles in monocotyledons are considered closed because:

1. a bundle sheath surrounds each bundle
2. cambium is absent
3. there are no vessels with perforations
4. xylem is surrounded all around by phloem

40 Identify the correct statement regarding collenchymas in plants:-

1. They occur in layers below the epidermis of 1. monocotyledonous plants.
2. Cells are much thickened at the corners due to the deposition of lignin.
3. Collenchymatous cells do not contain chloroplasts.
4. They provide mechanical strength to the growing parts of the plant.

41 Read the following statements about the vascular bundles:

In roots, xylem and phloem in a vascular bundle are
a. arranged in an alternate manner along the different radii.
b. Conjoint closed vascular bundles do not possess cambium.
In open vascular bundles, cambium is present in
c. between xylem and phloem.
d The vascular bundles of dicotyledonous stem possess
d. endarch protoxylem.
e. In monocotyledonous root, usually there are more
e. than six xylem bundles present.

Choose the correct answer from the options given below:

1. (a), (c), (d) and (e) only
2. (a), (b) and (d) only
3. (b), (c), (d) and (e) only
4. all statements are correct

42 Correct position of floral parts over thalamus in the mustard plant is:

1. Gynoecium occupies the highest position, while the other parts are situated below it.
Margin of the thalamus grows upward, enclosing the
2. ovary completely, and other parts arise below the ovary.
Gynoecium is present in the center and other parts cover it partially.
Gynoecium is situated in the center, and other parts of
3. the flower are located at the rim of the thalamus, at the same level.

43 Match List - I with List - II

|  | Type of flower |  | Example |
| :--- | :--- | :--- | :--- |
| (A) | Zygomorphic | (I) | Mustard |
| (B) | Hypogynous | (II) | Plum |
| (C) | Perigynous | (III) | Cassia |
| (D) | Epigynous | (IV) | Cucumber |

Choose the correct answer from the options given below:

| Options: | (A) | (B) | (C) | (D) |
| :--- | :--- | :--- | :--- | :--- |
| 1. | I | II | IV | III |
| 2. | I | II | III | IV |
| 3. | IV | I | III | II |
| 4. | III | I | II | IV |

44 The cortex of the stem, particularly in dicots, is differentiated into

1. epidermis, hypodermis and endodermis
2. epidermis, cuticle and endodermis
3. cuticle, epidermis and hypodermis
4. hypodermis, general cortex and endodermis

45 Given below are two statements:

| Assertion (A): | Trichomes are epidermal hairs on the <br> stem |
| :--- | :--- |
| Reason (R): | Trichomes are always unicellular |

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2 Both (A) and (R) are true but (R) is not the correct explanation of $(\mathbf{A})$.
2. (A) is true but ( $\mathbf{R}$ ) is false.
3. Both $\mathbf{( A )}$ and (R) are false.

46 In dicot stem the vascular bundle is:-

1. Conjoint, open and with exarch protoxylem.
2. Conjoint, open and with endarch protoxylem.
3. Conjoint and closed.
4. Scattered, each surrounded by a sclerenchymatous bundle sheath.

47 A plant with a fibrous root system and leaves with parallel venation would lack
I. A vascular cambium.
II. Secondary xylem and phloem.
III. A cork cambium.

1. I, II, and III
2. I and II
3. II and III
4. I and III

48 Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following :

1. Tyloses in vessels
2. Closure of stomata
3. Flaccidity of bulliform cells
4. Shrinkage of air spaces in spongy mesophyll

49 Dicot leaves are different from monocot leaves as in the former

1. Guard cells are dumb-cell shaped
2. More stomata are present at abaxial surface as compared to adaxial surface
3. Trichomes are usually unicellular
4. Guard cells possess chloroplasts

50 The most important function of the trichomes is:

1. They prevent water loss due to transpiration
2. They prevent herbivory
3. They are sensory structures that decipher the wind velocity and direction
4. They play an important part in pollination of plants

## Zoology - Section A

51 Given below are two statements:

| Statement <br> I: | The coagulum is formed of network of <br> threads called thrombins. |
| :--- | :--- |
| Statement <br> II: | Spleen is the graveyard of erythrocytes. |

In the light of the above statements, choose the most appropriate answer from the options given below:

1. Statement I is incorrect but Statement II is correct.
2. Both Statement I and Statement II are correct.
3. Both Statement I and Statement II are incorrect.
4. Statement I is correct but Statement II is incorrect.

52 Arrange the following formed elements in the decreasing order of their abundance in blood in humans :
(a) Platelets
(b) Neutrophils
(c) Erythrocytes
(d) Eosinophils
(e) Monocytes

Choose the most appropriate answer from the options given below :

1. (c), (a), (b), (e), (d)
2. (c), (b), (a), (e), (d)
3. (d), (e), (b), (a), (c)
4. (a), (c), (b), (d), (e)

53 There is a possibility of exposure of the maternal blood [of Rh -ve mother] to small amounts of $\mathrm{Rh}+\mathrm{ve}$ blood from the fetus during the:

1. First trimester of any pregnancy
2. Third trimester of the second pregnancy only
3. Delivery of the child
4. There is no such possibility

54 Describe urine in relationship to glomerular filtration tubular reabsorption and tubular secretion urine:
glomerular filtration + tubular reabsorption + tubular secretion
2. glomerular filtration - tubular reabsorption -tubular secretion
3. glomerular filtration + tubular reabsorption -tubular secretion
4. glomerular filtration -tubular reabsorption +tubular secretion

## 55

Given below are two statements:
Counter current mechanism helps in
Assertion (A): maintaining osmolarity of medullary interstitial fluid
Flow of filtrate is same in two limbs of
Reason (R): Henle's loop which forms counter current system

Both (A) and (R) are true and (R) is the correct explanation of (A).
Both (A) and (R) are true but (R) is not the correct explanation of $(\mathbf{A})$.
3. (A) is true but $(\mathbf{R})$ is false.
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are false.

Select incorrect statement among the following:
Asthma is an allergic condition characterised by

1. difficulty in breathing and accompanied by wheezing sounds
2. In asthma, there is no inflammation of bronchi and bronchioles
Pneumoconiosis is an occupational disease caused due to inhalation of various dust particles into lungs In emphysema, alveolar walls are damaged leading to reduction in respiratory surface

57
Given below are two statements:
Collecting duct plays a role in the
Assertion (A): maintenance of pH and ionic balance of blood

Reason (R):
Selective secretion of $\mathrm{H}^{+}$and $\mathrm{K}^{+}$ions
$\qquad$ into the filtrate take place in the collecting duct of the nephron

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true but (R) is not the correct explanation of (A).
3. (A) is true but ( $\mathbf{R}$ ) is false.
4. Both (A) and (R) are false.

58 What is used as an osmolyte in human beings to increase medullary interstitial osmolality during concentration of urine?

1. TMAO
2. Urea
3. Both $a$ and $b$
4. Uric acid

## 59

Given below are two statements:
Human kidneys can produce urine
Assertion (A): nearly four times more concentrated than the initial filtrate formed
Medullary interstitial gradient helps in

## Reason (R): easy passage of water from the loop of Henle only

1. Both (A) and (R) are true and (R) is the correct
2. explanation of (A).
3. Both (A) and (R) are true but (R) is not the correct 2. explanation of (A).
4. (A) is true but ( $\mathbf{R}$ ) is false.
5. Both (A) and (R) are false.

Match each item in Column I with one in Column II and select the correct option from the codes given:

| A. ADH |  |  | Vasoconstrictor, also stimulates adrenal cortex |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| B. | Aldosterone | Q. Regulates water reabsorption at collecting duct |  |  |  |
| C. | Renin | R. Catalyzes the formation of angiotensin I |  |  |  |
|  | Angiotensin II | S. <br> Promotes reabsorption of sodium at DCT |  |  |  |
| Codes |  |  |  |  |  |
|  | A |  | B | C | D |
| 1. | R |  | P | Q | S |
| 2. | Q |  | R | S | P |
| 3. | S |  | Q | P | R |
| 4. | Q |  | S | R | P |

The correct statements amongst the following are:
Cardiac output is volume of blood pumped by each ventricle per minute
II: All the four chambers of human heart are never in diastole together
The first heart sound is associated with opening of atrioventricular valves
IV: The pressure in pulmonary artery is equal to the pressure in aorta

1. Only I
2. Only I and IV
3. Only I and III
4. Only I, II and IV

62 A person with AB blood group:

1. Has $A$ and $B$ antigens in his plasma
2. Lacks any antibodies on RBC surface
3. Can receive blood transfusion from a person of his own group.
4. Can donate blood to all other group recipients

63
'Lub' heart sound is produced when

1. Blood flows from right atrium to right ventricle

Blood flows to aorta during initial phase of
2. ventricular diastole or joint diastole
3. Blood enters into the left atrium from pulmonary veins
4. AV -valves close during initial phase of ventricular systole

Given below are two statements:

| Assertion (A): | Filtrate gets diluted as it moves upwards <br> in ascending limb of loop of Henle |
| :--- | :--- |
| Reason (R): | Ascending limb is impermeable to water <br> but allows transport of electrolytes <br> actively or passively |

1. Both (A) and (R) are true and $(\mathbf{R})$ is the correct
2. explanation of (A).
${ }_{2}$ Both (A) and (R) are true but $(\mathbf{R})$ is not the correct 2. explanation of (A).
3. (A) is true but (R) is false.
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are false.

65
Consider the following statements:

I: Glomerulus is a tuft of capillaries formed by the efferent arteriole
II: Afferent arteriole forms the peritubular capillary network
III: Vasa recta is absent or highly reduced in juxtamedullary nephrons

1. Only III is correct
2. I is correct but II and III are incorrect
3. I, II and III are incorrect
4. I and II are correct


In the peripheral blood smear shown in the diagram, identify the letters that show the main phagocytic cells:


1. A and E
2. B and C
3. C and D
4. D and E

Angiotensin:
I: is a vasoconstrictor
II: stimulates the adrenal cortex to secrete aldosterone

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

68 Rise in heart beat, increase in the cardiac output and blood pressure occurs during emergency by the release of which hormone?

1. Aldosterone
2. Antidiuretic hormone
3. Epinephrine
4. Oxytocin

69 Match each item in Column I with one in Column II and select the correct match from the codes given:

|  | COLUMN I | COLUMN II |  |
| :--- | :--- | :--- | :--- |
| A | P wave on an ECG | P Ventricluar depolarization |  |
| B. | QRS complex on an <br> ECG | Q Atrial depolarization |  |
| C. | First heart sound | R Closure of semilunar valves |  |
| D. | Second heart sound | S | Closure of atrioventricular <br> valves |

Codes:

|  | A | B | C | D |
| :--- | :--- | :--- | :--- | :--- |
| 1. | Q | P | S | R |
| 2. | P | Q | S | R |
| 3. | P | Q | R | S |
| 4. | Q | P | R | S |

70 Select the circulatory disorder in which heart muscles are suddenly damaged by an inadequate blood supply:

1. Heart attack
2. Heart failure
3. Cardiac arrest
4. Atherosclerosis

71 If a person suspects major deficiency of clotting in himself, then which of the following would be looked for the confirmatory evidence?

1. Haemocytes
2. Serum albumins
3. Serum globulins
4. Fibrinogen in plasma

72 Identify the part of the nephron that:

I: is lined by cuboidal brush bordered epithelium
II: reabsorbs 70-80 percent of electrolytes and water

1. Proximal convoluted tubule
2. Loop of Henle
3. Distal convoluted tubule
4. Collecting duct

73 Which of the following cannot be considered as a point of difference between cortical and juxtamedullary nephrons?

1. Their number
2. Length of loop of Henle
3. Presence of vasa recta
4. Presence of peritubular capillaries

74 Match the items in Column - I with those in Column - II:
Column I
Column II
(a) Podocytes
(i) Crystallised oxalate
(b) Protonephridia
(ii) Annelids
(c) Nephridia
(iii) Amphioxus
(d) Renal calculi
(iv) Filtration slits

Select the correct option from the following:

|  | (a) | (b) | (c) | (d) |
| :--- | :--- | :--- | :--- | :--- |
| 1. | (iii) | (iv) | (ii) | (i) |
| 2. | (iii) | (ii) | (iv) | (i) |
| 3. | (iv) | (iii) | (ii) | (i) |
| 4. | (iv) | (ii) | (iii) | (i) |

75 Which of the following organ(s), other than kidneys, also help(s) in elimination of excretory wastes?
(a) Lungs
(b) Liver
(c) Skin
(d) Sebaceous glands

1. (a) only
2. (a) and (b)
3. (a), (b) and (c)
4. (a), (b), (c) and (d)

76 Select the correct match/representation

Percentage of

1. monocytes in total WBCs
Percentage of
2. neutrophils in total WBCs
Percentage of plasma in blood Percentage of formed elements in blood

Percentage of proteins in plasma

Percentage of water in plasma

Percentage of eosinophils in total WBCs
Percentage of
$=$ lymphocytes in total WBCs

77 A person ' X ' is a chain smoker. After some point of time he suffers from a respiratory disorder in which his alveolar walls are damaged. Identify that particular respiratory disorder and select the correct option.

1. Emphysema
2. Silicosis
3. Asthma
4. Asbestosis

78 The hepatic portal vein drains blood to the liver from:

1. Stomach
2. Kidneys
3. Intestine
4. Heart

79 Match the items given in Column I with those in Column II and select the correct option given below:

| Column I | Column II |  |  |
| :--- | :--- | :--- | :--- |
| (a) | Tricuspid <br> valve | (i) | Between left atrium and left <br> ventricle |
| (b) | Bicuspid <br> valve | (ii) | Between right ventricle and <br> pulmonary artery |
| (c) | Semilunar <br> valve | (iii) | Between right atrium and right <br> ventricle |


| Options: | (a) | (b) | (c) |
| :--- | :--- | :--- | :--- |
| 1. | iii | i | ii |
| 2. | i | iii | ii |
| 3. | i | ii | iii |
| 4. | ii | i | iii |

80 Match the Column I and Column II:

|  | Column-I |  | Column-II |
| :--- | :--- | :--- | :--- |
| (a) | P-waves | (i)Depolarisation of <br> ventricles |  |
| (b) | QRS complex | (ii) | Repolarisation of <br> ventricles |
| (c) | T-wave | (iii) Coronary ischemia |  |
| (d) | Reduction in the size of <br> T-wave | (iv) Depolarisation of atria |  |
|  |  | (v) Repolarisation of atria |  |

Select the correct option:

| Options: | (a) | (b) | (c) |
| :--- | :--- | :--- | :--- |
| (d) |  |  |  |
| 1. | (ii) | (iii) | (v) |
| (iv) |  |  |  |
| 2. | (iv) | (i) | (ii) |
| (iii) |  |  |  |
| 3. | (iv) | (i) | (ii) |
| 4. | (v) |  |  |
| (ii) | (i) | (v) | (iii) |

81 Inadequate supply of oxygen to heart muscles leads to a symptom of acute chest pain. This disorder of the circulatory system is identified as:

1. Angina pectoris
2. Cardiac arrest
3. Heart failure
4. Coronary Heart Disease

82 Consider the given two statements:
I: The type of antigen present on the RBCs of a person with blood group type A is A
II: The type of antibodies present in the plasma of a person with blood group type A is anti-A

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

83 Asthma may be attributed to?

1. allergic reaction of the mast cells in the lungs
2. inflammation of the trachea
3. accumulation of fluid in the lungs
4. bacterial infection of the lungs

84 Which group of animals respire through the lungs?

1. Earthworm and insects
2. Sponges, coelenterates and flatworms
3. Fishes and aquatic arthropods
4. Amphibians, reptiles, birds and mammals

5. 1000 and 1000
6. 1200 and 1000
7. 1000 and 1200
8. 1200 and 1200

## ZOOLOGY - SECTION B

86 Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because?

1. there is a negative pressure in the lungs
there is a negative intrapleural pressure pulling at the
2. lung walls
3. there is a positive intrapleural pressure
4. pressure in the lungs is higher than the atmospheric pressure

87 The partial pressure of oxygen is equal in

1. Atmospheric air and Alveoli
2. Alveoli and Oxygenated blood
3. Alveoli and Deoxygenated blood
4. Deoxygenated blood and Tissues

88 A decrease in plasma albumin levels is likely to affect:

1. Clot formation
2. Oxygenation of hemoglobin
3. Osmotic balance
4. Immune functions

89 Identify the wrong statement with reference to transport of oxygen:

Partial pressure of $\mathrm{CO}_{2}$ can interfere with $\mathrm{O}_{2}$ binding

1. with haemoglobin.
2. Higher $\mathrm{H}^{+}$concentration in alveoli favours the formation of oxyhaemoglobin.
Low $\mathrm{pCO}_{2}$ in alveoli favours the formation of 3. oxyhaemoglobin.
Binding of oxygen with haemoglobin is mainly
related to partial pressure of $\mathrm{O}_{2}$.

90 Normal activities of the human heart are regulated:

1. Intrinsically
2. By the autonomic nervous system
3. By the brain stem
4. By the diencephalon

91 A center that moderates the functions of the respiratory rhythm center is located in:

1. Dorsal medulla oblongata
2. Ventral medulla oblongata
3. Pons Varolii
4. Pre-central gyrus of the cerebrum

92 Which of the following values for the given parameter is incorrect?

| 1. | Partial pressure of oxygen in alveolar air | 104 mm |
| :--- | :--- | :--- |
| Hg |  |  |$|$| 2.Partial pressure of carbon dioxide in <br> deoxygenated blood | 45 mm |
| :--- | :--- |
| 3.Transport of carbon dioxide in blood as <br> bicarbonate | $70 \%$ |
| 4.Transport of carbon dioxide as <br> carbaminohemoglobin | $7 \%$ |

93 If a person exhales out forcefully by applying all his efforts. What will be the pulmonary volume inhaled by him immediately under normal condition without applying any extra effort?

1. TV + IRV
2. TV only
3. TV + ERV
4. TV + IRV + ERV

94 Contraction of diaphragm:
Increases the volume of the thoracic chamber in the antero-posterior axis
Increases the volume of the thoracic chamber in the dorso-ventral axis

Decreases the volume of the thoracic chamber in the antero-posterior axis
Decreases the volume of the thoracic chamber in the dorso-ventral axis

95 For each unit difference in the partial pressure across the diffusion membrane, the amount of carbon dioxide that diffuses:
is higher than the amount of oxygen as the solubility

1. of carbon dioxide is 20-25 times lower than that of oxygen
is lower than the amount of oxygen as the solubility
2. of carbon dioxide is $20-25$ times lower than that of oxygen
is higher than the amount of oxygen as the solubility
3. of carbon dioxide is 20-25 times higher than that of oxygen
is lower than the amount of oxygen as the solubility
4. of carbon dioxide is 20-25 times higher than that of oxygen

96 Blood pressure in the mammalian aorta is maximum during:

1. systole of the left atrium
2. diastole of the right ventricle
3. systole of the left ventricle
4. diastole of the right atrium

97 Which one of the following hormones reduces blood pressure?

1. Antidiuretic hormone
2. Atrial Natriuretic factor
3. Aldosterone
4. Angiotensin-II

98 Haemoglobin is:

1. An oxygen carrier in human blood
2. A protein used as a food supplement
3. An oxygen scavenger in root nodules
4. A plant protein with high lysine content

99 Given below are two statements:
The part of the respiratory system starting with the external nostrils upto
Assertion (A): terminal bronchioles constitutes the conducting part, whereas the alveoli from respiratory part.
Conducting part transports the atmospheric air to alveoli, clears it from foreign particles, humidifies it and also brings the air to body temperature.

Both (A) and (R) are true and $(\mathbf{R})$ is the correct explanation of (A).
2. Both (A) and (R) are true but $(\mathbf{R})$ is not the correct explanation of (A).
3. (A) is true but ( $\mathbf{R}$ ) is false.
4. Both (A) and (R) are false.

100 Given below are two statements:
$\mathrm{CO}_{2}$ trapped as bicarbonate at the tissue
Assertion (A): level and transported to the alveoli, is released out as $\mathrm{CO}_{2}$.

At tissue level, high $\mathrm{pCO}_{2}$ favours the formation of $\mathrm{HCO}_{3}^{-}$and $\mathrm{H}^{+}$from $\mathrm{CO}_{2}$ and $\mathrm{H}_{2} \mathrm{O}$ while the reaction is reversed at alveoli.

| 1. Both $\mathbf{( A )}$ and $(\mathbf{R})$ are true and $(\mathbf{R})$ is the correct |
| :--- |
| explanation of $(\mathbf{A})$. |
| 2. Both $(\mathbf{A})$ and $(\mathbf{R})$ are true but $(\mathbf{R})$ is not the correct |
| explanation of $(\mathbf{A})$. |
| 3. (A) is true but $\mathbf{( R )}$ is false. |
| 4. Both $\mathbf{( A )}$ and $(\mathbf{R})$ are false. |

## CHEMISTRY - SECTION A

101 The enthalpy of a system increases by 50 kJ when its internal energy is increased by 113 kJ . What is the pressure in $\mathrm{kNm}^{-2}$ of the system if the volume of gas is reduced by $10 \mathrm{~m}^{3}$ at constant pressure?
(Given: $1 \mathrm{~J}=1 \mathrm{Nm}$ )

1. 16.13
2. 6.3
3.5
3. 30.3

102 In which of the following reactions, the underlined substance has been oxidized?

1. $\underline{\mathrm{Br}}_{2}+\mathrm{H}_{2} \mathrm{~S} \rightarrow 2 \mathrm{HBr}+\mathrm{S}$
2. $2 \mathrm{HgCl}_{2}+\mathrm{SnCl}_{2} \rightarrow \underline{\mathrm{Hg}}_{2} \mathrm{Cl}_{2}+\mathrm{SnCl}_{4}$
3. $\mathrm{Cl}_{2}+2 \mathrm{KI} \rightarrow 2 \mathrm{KCl}+\underline{\mathrm{I}}_{2}$
4. $2 \mathrm{Cu}^{2+}+4 \mathrm{I}^{-} \rightarrow \mathrm{Cu}_{2} \mathrm{I}_{2}+\mathrm{I}_{2}$

103 The volume of $\mathrm{HBr}(0.02 \mathrm{M})$ (in ml) needed to completely neutralize $\mathrm{Ba}(\mathrm{OH})_{2}(0.01 \mathrm{M}, 10 \mathrm{ml})$ :

1. 5 ml
2. 15 ml
3. 20 ml
4. 10 ml

104 The pH of $10^{-2} \mathrm{M} \mathrm{NH}_{4} \mathrm{CN}$ solution is:
(Given that $\mathrm{K}_{\mathrm{a}}$ of HCN $=5 \times 10^{-10}$ and $\mathrm{K}_{\mathrm{b}}$ of (aq. $\mathrm{NH}_{3}$ ) $=2 \times 10^{-5}$ at $25^{\circ} \mathrm{C}$ )

1. 9.9
2. 9.3
3. 7.6
4. 8.4

105 The amount of energy necessary to heat a 2.5 g ice cube from $0^{\circ} \mathrm{C}$ to $23^{\circ} \mathrm{C}$ is:
Values for $\mathrm{H}_{2} \mathrm{O}$
$C_{p} \quad 4.18 \mathrm{Jg}^{-1} \mathrm{C}^{-1}$
$\Delta H_{\text {fusion }} 3.4 \times 10^{2} \mathrm{Jg} \mathrm{g}^{-1}$

1. 240 J
2. 850 J
3. 1100 J
4. 3700 J

106 A group of scientists is studying the dynamics of the acetic acid dissociation below and bring the process to equilibrium under standard conditions. If the scientists then add 35 g of sodium acetate to the reaction container, which of the following will be true?

$$
\mathrm{CH}_{3} \mathrm{COOH}(\mathrm{aq}) \rightleftharpoons \mathrm{CH}_{3} \mathrm{COO}^{-}(\mathrm{aq})+\mathrm{H}^{+}(\mathrm{aq})
$$

1. $\mathrm{Q}>\mathrm{K}_{\mathrm{eq}}$ and the reaction will move in reverse.
2. $\mathrm{Q}<\mathrm{K}_{\mathrm{eq}}$ and the reaction will move forward.
3. $\mathrm{Q}>\mathrm{K}_{\mathrm{eq}}$ and the reaction will move forward.
4. $\mathrm{Q}<\mathrm{K}_{\mathrm{eq}}$ and the reaction will move in reverse.

107 If the enthalpy of vaporization of $C C l_{4}$ is 15.4 kJ $\mathrm{mol}^{-1}$, then the heat required for the vaporization of 30 g of $C C l_{4}$ at constant pressure is:
(Given: Molar mass of $C C l_{4}=154 \mathrm{~g} \mathrm{~mol}^{-1}$ )

| 1. | 15.4 kJ | 2. | 3.0 kJ |
| :--- | :--- | :--- | :--- |
| 3. | 462 kJ | 4. | 5.13 kJ |

108 If $\mathrm{pK}_{\mathrm{a}}$ of $\mathrm{CH}_{3} \mathrm{COOH}$ is 5 then $\mathrm{K}_{\mathrm{b}}$ of $\mathrm{CH}_{3} \mathrm{CO} \bar{O}$ will be:

| 1. | 9 | 2. | $10^{-9}$ |
| :--- | :--- | :--- | :--- |
| 3. | $10^{-5}$ | 4. | $10^{5}$ |

109 Which of the following $\mathrm{p}-\mathrm{V}$ curve represents the maximum work done?


111 For the reaction,
$\mathrm{CaCO}_{3}(\mathrm{~s}) \rightleftharpoons \mathrm{CaO}(\mathrm{s})+\mathrm{CO}_{2}(\mathrm{~g}), \mathrm{K}_{\mathrm{p}}=1.16 \mathrm{~atm}$
at $800{ }^{\circ} \mathrm{C}$. If 40 g of $\mathrm{CaCO}_{3}$ were kept in a 5 L vessel at $800^{\circ} \mathrm{C}$, the moles of $\mathrm{CaCO}_{3}$ remained at equilibrium is:

1. 0.33
2. 0.45
3. 0.63
4. 0.21

112 The equilibrium constant for the following reactions are $K_{1}$ and $K_{2}$, respectively
$2 \mathrm{P}(\mathrm{g})+3 \mathrm{Cl}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{PCl}_{3}(\mathrm{~g})$
$\mathrm{PCl}_{3}(\mathrm{~g})+\mathrm{Cl}_{2}(\mathrm{~g}) \rightleftharpoons \mathrm{PCl}_{5}(\mathrm{~g})$
Then the equilibrium constant for the reaction $2 \mathrm{P}(\mathrm{g})+$ $5 \mathrm{Cl}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{PCl}_{5}(\mathrm{~g})$ will be

1. $\mathrm{K}_{1} \mathrm{~K}_{2}$
2. $\mathrm{K}_{1} \mathrm{~K}_{2}{ }^{2}$
3. $\mathrm{K}_{1}{ }^{2} \mathrm{~K}_{2}{ }^{2}$
4. $\mathrm{K}_{1}{ }^{2} \mathrm{~K}_{2}$

113 The concentration of hydrogen ions in a sample of soft drink is $3.8 \times 10^{-3} \mathrm{M}$. The pH of soft drink is-
(Given: $\log 3.8=0.58$ )

1. 1.45
2. 2.42
3. 3.76
4. 2.79

114 Which one of the following can be classified as a
Bronsted base?

1. $\mathrm{NO}_{3}^{-}$
2. $\mathrm{H}_{3} \mathrm{O}^{+}$
3. $\mathrm{NH}_{4}^{+}$
4. $\mathrm{CH}_{3} \mathrm{COOH}$

115 When the volume of the container is doubled then which of the following equilibrium shift in the right(forward) direction?

1. $2 \mathrm{SO}_{2}(\mathrm{~g})+\mathrm{O}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{SO}_{3}(\mathrm{~g})$
2. $\mathrm{N}_{2}(\mathrm{~g})+3 \mathrm{H}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{NH}_{3}(\mathrm{~g})$
3. $\mathrm{N}_{2} \mathrm{O}_{4}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{NO}_{2}(\mathrm{~g})$
4. $2 \mathrm{HI}(\mathrm{g}) \rightleftharpoons \mathrm{H}_{2}(\mathrm{~g})+\mathrm{I}_{2}(\mathrm{~g})$

116 The dissociation constants of monobasic acids A, $\mathrm{B}, \mathrm{C}$, and D are $6 \times 10^{-4}, 5 \times 10^{-5}, 3.6 \times 10^{-6}$ and $7 \times 10^{-10}$ respectively. The pH values of their 0.1 molar aqueous solutions are in the order of:

1. $\mathrm{A}<\mathrm{B}<\mathrm{C}<\mathrm{D}$
2. $\mathrm{A}>\mathrm{B}>\mathrm{C}>\mathrm{D}$
3. $\mathrm{A}=\mathrm{B}=\mathrm{C}=\mathrm{D}$
4. $\mathrm{A}>\mathrm{B}<\mathrm{C}>\mathrm{D}$

117 Given below are two statements:

Statement
I:

Statement
II:

The expansion of gas against external pressure $\left(\mathrm{P}_{\mathrm{ext}} \neq 0\right)$ is called free expansion.
No work is done during the expansion of an ideal gas when the process is reversible only.

In light of the above statements choose the correct answer from the options given below:

1. Both statement I and statement II are true.
2. Both statement I and statement II are false.
3. Statement $I$ is correct but statement II is false.
4. Statement I is incorrect but statement II is true.

118 For a given reaction, $\Delta \mathrm{H}=35.5 \mathrm{~kJ} \mathrm{~mol}^{-1}$ and $\Delta \mathrm{S}=$ $83.6 \mathrm{~J} \mathrm{~K}^{-1} \mathrm{~mol}^{-1}$. The reaction is spontaneous at:
(Assume that $\Delta \mathrm{H}$ and $\Delta \mathrm{S}$ do not vary with temperature)

1. $\mathrm{T}>425 \mathrm{~K}$
2. All temperatures
3. $\mathrm{T}>298 \mathrm{~K}$
4. $\mathrm{T}<425 \mathrm{~K}$

## 119

The standard enthalpy change for the formation of one mole of a compound
Statement I: from its elements in their most stable states (reference states) is called standard molar enthalpy of formation.
For, $\mathrm{CaO}(\mathrm{s})+\mathrm{CO}_{2}(\mathrm{~g}) \rightarrow \mathrm{CaCO}_{3}(\mathrm{~s})$;
Statement II: $\Delta_{\mathrm{f}} \mathrm{H}^{\ominus}=-178.3 \mathrm{kJmol}^{-1}$, the $\Delta_{\mathrm{r}} \mathrm{H}^{\ominus}$ is equal to the $\Delta_{\mathrm{f}} \mathrm{H}^{\ominus}$.

1. Both statements I and II are true.
2. Statement I is true and statement II is false.
3. Both statements I and II are false.
4. Statement I is false, statement II is true.

120 For the reaction
$\mathrm{PCl}_{3}(g)+\mathrm{Cl}_{2}(g) \rightarrow \mathrm{PCl}_{5}(g), \Delta H^{\circ}=-86 \mathrm{~kJ}$. Under what temperatures is this reaction expected to be spontaneous?

1. No temperatures
2. High temperatures only
3. All temperatures
4. Low temperatures only

121 Which of the following mixture act as a buffer solution?

1. 100 ml of $1 \mathrm{M} \mathrm{CH}_{3} \mathrm{COOH}+25 \mathrm{ml} 5 \mathrm{M} \mathrm{NaOH}$
2. $150 \mathrm{ml} 0.1 \mathrm{HCOOH}+20 \mathrm{ml} 1 \mathrm{M} \mathrm{KOH}$
3. $200 \mathrm{ml} 0.5 \mathrm{M} \mathrm{NH}_{4} \mathrm{OH}+50 \mathrm{ml} 2 \mathrm{M} \mathrm{H}_{2} \mathrm{SO}_{4}$
4. $100 \mathrm{ml} 1 \mathrm{M} \mathrm{NH}_{4} \mathrm{OH}+40 \mathrm{ml} 1 \mathrm{M} \mathrm{HCI}$

122 For the reaction,
$2 \mathrm{SO}_{2}(\mathrm{~g})+\mathrm{O}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{SO}_{3}(\mathrm{~g}) ; \Delta \mathrm{H}^{\circ}<0$
Which change(s) will increase the fraction of $\mathrm{SO}_{3}(\mathrm{~g})$ in the equilibrium mixture?
I. Increasing the pressure
II. Increasing the temperature
III. Adding a catalyst

1. I only
2. III only
3. I and III only
4. I, II, and III

123 An aqueous solution contains $\mathrm{SCN}^{-}, \mathrm{Br}^{-}, \mathrm{I}^{-}$, and $\mathrm{CI}^{-}$ions of equimolar concentration. On adding $\mathrm{AgNO}_{3}$ we should first expect precipitation of:
Given: $\mathrm{K}_{\mathrm{sp}}$ of $\mathrm{AgCI}=1.2 \times 10^{-10}$
$K_{s p}$ of $\mathrm{AgBr}=3.5 \times 10^{-13}$
$K_{s p}$ of $A g I=1.7 \times 10^{-16}$
$K_{s p}$ of $A g S C N=7.1 \times 10^{-13}$

1. AgCI
2. AgBr
3. AgI
4. AgSCN

124 Which of the following is not a pair of a lewis acid and a lewis base?

1. $\mathrm{H}^{+},\left(\mathrm{C}_{2} \mathrm{H}_{5}\right)_{2} \mathrm{O}$
2. $\mathrm{H}_{2} \mathrm{O}, \mathrm{AlCl}_{3}$
3. $\mathrm{Fe}^{3+}, \mathrm{CO}$
4. $\mathrm{SiF}_{4}, \mathrm{BF}_{3}$

125 If the solubility product of $\mathrm{Mg}(\mathrm{OH})_{2}$ is $2 \times 10^{-11}$ at 298 K , then the solubility in $\mathrm{mol} / \mathrm{dm}^{3}$ at 298 K is:

1. $2.48 \times 10^{-4} \mathrm{~mol} / \mathrm{dm}^{3}$
2. $1.71 \times 10^{-4} \mathrm{~mol} / \mathrm{dm}^{3}$
$3.17 .1 \times 10^{-4} \mathrm{~mol} / \mathrm{dm}^{3}$
3. $3.47 \times 10^{-4} \mathrm{~mol} / \mathrm{dm}^{3}$

126 The reaction that has a minimum value of $\mathrm{K}_{\mathrm{P}} / \mathrm{K}_{\mathrm{C}}$ is:

1. $\mathrm{N}_{2}(\mathrm{~g})+3 \mathrm{H}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{NH}_{3}(\mathrm{~g})$
2. $\mathrm{PCI}_{5}(\mathrm{~g}) \rightleftharpoons \mathrm{PCI}_{3}+\mathrm{CI}_{2}(\mathrm{~g})$
3. $2 \mathrm{HI}(\mathrm{g}) \rightleftharpoons \mathrm{H}_{2}(\mathrm{~g})+\mathrm{I}_{2}(\mathrm{~g})$
4. $\mathrm{N}_{2} \mathrm{O}_{4}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{NO}_{2}(\mathrm{~g})$

127 Which of the following reactions is a redox reaction?

1. $\mathrm{P}_{2} \mathrm{O}_{5}+2 \mathrm{H}_{2} \mathrm{O} \rightarrow \mathrm{H}_{4} \mathrm{P}_{2} \mathrm{O}_{7}$
2. $2 \mathrm{AgNO}_{3}+\mathrm{BaCl}_{2} \rightarrow 2 \mathrm{AgCl}+\mathrm{Ba}\left(\mathrm{NO}_{3}\right)_{2}$
3. $\mathrm{BaCl}_{2}+\mathrm{H}_{2} \mathrm{SO}_{4} \rightarrow \mathrm{BaSO}_{4}+2 \mathrm{HCl}$
4. $\mathrm{Cu}+2 \mathrm{AgNO}_{3} \rightarrow 2 \mathrm{Ag}+\mathrm{Cu}\left(\mathrm{NO}_{3}\right)_{2}$

128 What is the standard enthalpy of formation of $\mathrm{MgO}(\mathrm{s})$ if 300.9 kJ is evolved when 20.15 g of $\mathrm{MgO}(\mathrm{s})$ is formed by the combustion of magnesium under standard conditions?

1. $-601.8 \mathrm{~kJ} \mathrm{~mol}^{-1}$
2. $-300.9 \mathrm{~kJ} \mathrm{~mol}^{-1}$
3. $+300.9 \mathrm{~kJ} \mathrm{~mol}^{-1}$
4. $+601.8 \mathrm{~kJ} \mathrm{~mol}^{-1}$

129 Three thermochemical equations are given below:
(i) $\mathrm{C}_{\text {(graphite) }}+\mathrm{O}_{2}(\mathrm{~g}) \rightarrow \mathrm{CO}_{2}(\mathrm{~g}) ; \Delta_{r} \mathrm{H}^{\circ}=\mathrm{x} \mathrm{kJ} \mathrm{mol}^{-1}$
(ii) $\mathrm{C}_{\text {graphite }}+1 / 2 \mathrm{O}_{2}(\mathrm{~g}) \rightarrow \mathrm{CO}(\mathrm{g}) ; \Delta_{r} \mathrm{H}^{\circ}=\mathrm{y} \mathrm{kJ} \mathrm{mol}{ }^{-1}$
(iii) $\mathrm{CO}(\mathrm{g})+1 / 2 \mathrm{O}_{2}(\mathrm{~g}) \rightarrow \mathrm{CO}_{2}(\mathrm{~g}) ; \Delta_{r} \mathrm{H}^{\circ}=\mathrm{z} \mathrm{kJ} \mathrm{mol}^{-1}$

Based on the above equations, find out which one of the relationships given below is correct :

| 1. | $\mathrm{z}=\mathrm{x}+\mathrm{y}$ | 2. | $\mathrm{x}=\mathrm{y}+\mathrm{z}$ |
| :--- | :--- | :--- | :--- |
| 3. | $\mathrm{y}=2 \mathrm{z}-\mathrm{x}$ | 4. | $\mathrm{x}=\mathrm{y}-\mathrm{z}$ |

130 The pH of the mixture of 10 mL of $0.1 \mathrm{M} \mathrm{H}_{2} \mathrm{SO}_{4}$ and 90 mL of 0.1 M KOH is:
$(\log 7=0.85)$

1. 2.85
2. 5.90
3. 8.45
4. 12.85

131 A sample containing 1.0 mol of an ideal gas is expanded isothermally and reversible to ten times of its original volume in two separate experiments. The expansion is carried out at 300 K and at 600 K respectively.
The correct statements among the following are-
Work done at 600 K is 20 times the work done at 300 a. K
b. Work done at 300 K is twice the work done at 600 K
c. Work done at 600 K is twice the work done at 300 K
d. $\Delta \mathrm{U}=0$ in both cases

1. $(\mathrm{a}, \mathrm{b})$
2. (b, c)
3. (c, d)
4. $(a, d)$

132 If the heat produced by $4 \mathrm{~A}+3 \mathrm{O}_{2} \rightarrow 2 \mathrm{~A}_{2} \mathrm{O}_{3}$ is 2000 kJ , then the heat of combustion $\left(\Delta H_{\text {combustion }}^{o}\right)$ of " A " is:

1. $-2000 \mathrm{~kJ} / \mathrm{mole}$
2. $-1000 \mathrm{~kJ} / \mathrm{mole}$
3. $-500 \mathrm{~kJ} / \mathrm{mole}$
4. $-250 \mathrm{~kJ} / \mathrm{mol}$

133 A 25 mL buffer solution is prepared by mixing $\mathrm{CH}_{3} \mathrm{COOH}$ of concentration 0.1 M and $\mathrm{CH}_{3} \mathrm{COONa}$ of concentration 0.01 M . If the pH of the solution is 5 , then the $\mathrm{pK}_{\mathrm{a}}$ of $\mathrm{CH}_{3} \mathrm{COOH}$ is:

1. 4
2. 5
3. 6
4. 7

134 The correct order of increasing solubility of AgCI in $\mathrm{A}=$ water, $\mathrm{B}=0.1 \mathrm{M} \mathrm{NaCI}, \mathrm{C}=0.1 \mathrm{M} \mathrm{BaCI}_{2}$ and D $=0.1 \mathrm{M} \mathrm{NH}_{3}$ is:

1. $\mathrm{D}>\mathrm{A}>\mathrm{B}>\mathrm{C}$
2. $\mathrm{D}>\mathrm{C}>\mathrm{B}>\mathrm{A}$
3. $\mathrm{B}>\mathrm{A}>\mathrm{D}>\mathrm{C}$
4. $\mathrm{A}>\mathrm{D}>\mathrm{B}>\mathrm{C}$

135 Which of the following represents a disproportionation reaction?

1. $\mathrm{Cl}_{2}+2 \mathrm{OH}^{-} \rightarrow \mathrm{ClO}^{-}+\mathrm{Cl}^{-}+\mathrm{H}_{2} \mathrm{O}$
2. $\mathrm{Cu}_{2} \mathrm{O}+\mathrm{H}^{+} \rightarrow \mathrm{Cu}+\mathrm{Cu}^{2+}+\mathrm{OH}^{-}$
3. $2 \mathrm{HCuCl}_{2} \xrightarrow[\text { with } \mathrm{H}_{2} \mathrm{O}]{\text { dilution }} \mathrm{Cu}+\mathrm{Cu}^{2+}+4 \mathrm{Cl}^{-}+2 \mathrm{H}^{+}$
4. All the three above.

## Chemistry - Section B

$1362 \mathrm{Na}(\mathrm{s})+2 \mathrm{H}_{2} \mathrm{O}(\mathrm{l}) \rightarrow 2 \mathrm{Na}^{+}(\mathrm{aq})+2 \mathrm{OH}^{-}(\mathrm{aq})+\mathrm{H}_{2}(\mathrm{~g})$. Which of the following options is correct for the above reaction?

1. Disproportionation redox reaction.
2. $\mathrm{H}_{2} \mathrm{O}$ acts as a reducing agent.
3. Na gets reduced.
4. Na acts as a reducing agent.

137 Consider the following reaction:
$\mathrm{Pb}_{3} \mathrm{O}_{4}+4 \mathrm{HNO}_{3} \rightarrow \mathrm{~A}+\mathrm{B}+2 \mathrm{H}_{2} \mathrm{O}$
A and B are respectively-

1. $\mathrm{A}=\mathrm{Pb}\left(\mathrm{NO}_{3}\right)_{4} ; \mathrm{B}=\mathrm{PbO}_{2}$
2. $\mathrm{A}=\mathrm{Pb} ; \mathrm{B}=\mathrm{O}_{2}$
3. $\mathrm{A}=\mathrm{Pb}\left(\mathrm{NO}_{3}\right)_{2} ; \mathrm{B}=\mathrm{PbO}_{2}$
4. $\mathrm{A}=\mathrm{PbO} ; \mathrm{B}=\mathrm{NO}_{2}$

## 138

Assertion (A):

## Reason (R):

Absolute values of the internal energy of substances cannot be determined. It is impossible to determine the exact values of constituent energies of the substances.

Both (A) and (R) are true and (R) is the correct explanation of $(\mathbf{A})$.
Both (A) and (R) are true but ( $\mathbf{R}$ ) is not the correct explanation of (A).
3. $(\mathbf{A})$ is true but $(\mathbf{R})$ is false.
4. Both (A) and (R) are false.

## 139

Assertion (A):
There cannot be chemical equilibrium in an open system.

Reason (R):
There is no fixed mass in an open system.

Both (A) and (R) are true and (R) is the correct explanation of (A).
${ }_{2}$ Both (A) and (R) are true but (R) is not the correct explanation of $(\mathbf{A})$.
3. $(A)$ is true but $(R)$ is false.
4. $(A)$ is false but $(R)$ is true.

140 At 298 K , the standard electrode potentials of $\mathrm{Cu}^{2+} / \mathrm{Cu}, \mathrm{Zn}^{2+} / \mathrm{Zn}, \mathrm{Fe}^{2+} / \mathrm{Fe}$ and $\mathrm{Ag}^{+} / \mathrm{Ag}$ are $0.34 \mathrm{~V},-0.76 \mathrm{~V},-0.44 \mathrm{~V}$ and 0.80 V , respectively.
On the basis of standard electrode potentials, predict which of the following reaction can not occur?

| 1. | $2 \mathrm{CuSO}_{4}(\mathrm{aq})+2 \mathrm{Ag}(\mathrm{s}) \rightarrow 2 \mathrm{Cu}(\mathrm{s})+\mathrm{Ag}_{2} \mathrm{SO}_{4}(\mathrm{aq})$ |
| :--- | :--- |
| 2. $\mathrm{CuSO}_{4}(\mathrm{aq})+\mathrm{Zn}(\mathrm{s}) \rightarrow \mathrm{ZnSO}_{4}(\mathrm{aq})+\mathrm{Cu}(\mathrm{s})$ |  |
| 3. | $\mathrm{CuSO}_{4}(\mathrm{aq})+\mathrm{Fe}(\mathrm{s}) \rightarrow \mathrm{FeSO}_{4}(\mathrm{aq})+\mathrm{Cu}(\mathrm{s})$ |
| 4. | $\mathrm{FeSO}_{4}(\mathrm{aq})+\mathrm{Zn}(\mathrm{s}) \rightarrow \mathrm{ZnSO}_{4}(\mathrm{aq})+\mathrm{Fe}(\mathrm{s})$ |

141 The value of ' $n$ ' in the following redox reaction is-
$\mathrm{IO}_{3}^{-}+\mathrm{H}^{+}+\mathrm{nl}^{-} \longrightarrow 6 \mathrm{I}_{2}+\mathrm{H}_{2} \mathrm{O}$

| 1. | 10 | 2. | 12 |
| :--- | :--- | :--- | :--- |
| 3. | 9 | 4. | 5 |

142 Match the compounds in column I with the oxidation state of Cl in column II.

| Column I | Column II |
| :--- | :--- |
| a. $\mathrm{Cl}_{2} \mathrm{O}_{7}$ | i. +4 |
| b. $\mathrm{NaClO}_{3}$ | ii. +1 |
| c. $\mathrm{Cl}_{2} \mathrm{O}$ | iii. +5 |
| d. $\mathrm{ClO}_{2}$ | iv. +7 |

Options:

|  | a | b | c | d |
| :--- | :--- | :--- | :--- | :--- |
| 1. | iii | iv | ii | i |
| 2. | ii | iii | iv | i |
| 3. | iv | iii | ii | i |
| 4. | iv | i | iii | ii |

143 The exothermic formation of $\mathrm{ClF}_{3}$ is represented by the equation:
$\mathrm{Cl}_{2}(\mathrm{~g})+3 \mathrm{~F}_{2}(\mathrm{~g}) \rightleftharpoons 2 \mathrm{ClF}_{3}(\mathrm{~g}) ; \Delta \mathrm{Hr}=-329 \mathrm{~kJ}$
Which of the following will increase the quantity of
$\mathrm{ClF}_{3}$ is an equilibrium mixture of $\mathrm{Cl}_{2}, \mathrm{~F}_{2}$, and $\mathrm{ClF}_{3}$ ?

1. Adding $\mathrm{F}_{2}$
2. Increasing the volume of the container
3. Removing $\mathrm{Cl}_{2}$
4. Increasing the temperature

144 The molar solubility of $\mathrm{Cd}(\mathrm{OH})_{2}$ is $1.84 \times 10^{-5} \mathrm{M}$ in water. The expected solubility of $\mathrm{Cd}(\mathrm{OH})_{2}$ in a buffer solution of $\mathrm{pH}=12$ is:

1. $2.49 \times 10^{-10} M$
2. $1.84 \times 10^{-9} M$
3. $6.23 \times 10^{-11} M$
4. $1.49 \times 10^{-9} M$

145 In the reaction:
$\mathrm{N}_{2} \mathrm{H}_{4}(\mathrm{l})+2 \mathrm{H}_{2} \mathrm{O}_{2} \rightarrow \mathrm{~N}_{2}(g)+4 \mathrm{H}_{2} \mathrm{O}(\mathrm{l})$
Oxidant and reductant respectively are:

1. $\mathrm{H}_{2} \mathrm{O}_{2}, \mathrm{~N}_{2} \mathrm{H}_{4}$
2. $\mathrm{H}_{2} \mathrm{O}_{2}, \mathrm{~N}_{2}$
3. $\mathrm{N}_{2} \mathrm{H}_{4}, \mathrm{H}_{2} \mathrm{O}$
4. $\mathrm{N}_{2} \mathrm{H}_{4}, \mathrm{H}_{2} \mathrm{O}_{2}$

146 In which one of the following reactions is the underlined species acting as an oxidizing agent?

1. $\underline{\mathrm{Cl}}_{2}+2 \mathrm{KBr} \rightarrow 2 \mathrm{KCl}+\mathrm{Br}_{2}$
2. $\mathrm{Zn}+\mathrm{CuSO}_{4} \rightarrow \mathrm{ZnSO}_{4}+\mathrm{Cu}$
3. $3 \underline{\mathrm{CO}}+\mathrm{Fe}_{2} \mathrm{O}_{3} \rightarrow 3 \mathrm{CO}_{2}+2 \mathrm{Fe}$
4. $\underline{\mathrm{H}}_{2} \mathrm{SO}_{4}+2 \mathrm{NaOH} \rightarrow \mathrm{Na}_{2} \mathrm{SO}_{4}+2 \mathrm{H}_{2} \mathrm{O}$

147 The solubility product of $\mathrm{CuS}, \mathrm{Ag}_{2} \mathrm{~S} . \mathrm{HgS}$ are 10 ${ }^{-37}, 10^{-44}$ and $10^{-54}$ respectively. The solubilities of these sulphides are in the order of:

1. $\mathrm{Ag}_{2} \mathrm{~S}>\mathrm{CuS}>\mathrm{HgS}$
2. $\mathrm{Ag}_{2} \mathrm{~S}>\mathrm{HgS}>\mathrm{CuS}$
3. $\mathrm{HgS}>\mathrm{Ag}_{2} \mathrm{~S}>\mathrm{CuS}$
4. $\mathrm{CuS}>\mathrm{Ag}_{2} \mathrm{~S}>\mathrm{HgS}$

148 The oxidation number of phosphorus $\mathrm{Mg}_{2} \mathrm{P}_{2} \mathrm{O}_{7}$ is:

1. +3
2. +2
3. +5
4. -3

149 The ionization constant of $\mathrm{CH}_{3} \mathrm{COOH}$ is $1.7 \times$ $10^{-5}$ and the concentration of $\mathrm{H}^{+}$ions is $3.4 \times 10^{-4}$. The initial concentration of $\mathrm{CH}_{3} \mathrm{COOH}$ will be:

1. $3.4 \times 10^{-4}$
2. $3.4 \times 10^{-3}$
3. $6.8 \times 10^{-4}$
4. $6.8 \times 10^{-3}$

## 150

Statement $A g F_{2}$ acts as a very strong oxidizing agent I:
Statement Carbon exhibits oxidation states from -4 to II: +4 in its compounds.

In the light of above two statements, choose the correct option among the following

1. Both statement I and statement II are correct.
2. Both statement I and statement II are incorrect.
3. Statement $I$ is correct but statement II is incorrect.
4. Statement I is incorrect but statement II is correct.

## Physics - Section A

151 A stretched rubber has:

1. increased kinetic energy
2. increased potential energy
3. decreased kinetic energy
4. decreased potential energy

152 The figure shows two blocks of masses $m$ and $M$ connected by a string passing over a pulley. The horizontal table over which the mass $m$ slides is smooth. The pulley has a radius $r$ and moment of inertia $I$ about its axis and it can freely rotate about this axis. The acceleration of the mass $M$ assuming that the string does not slip on the pulley is:


1. $\frac{m g}{M+m+I / r^{2}}$
2. $\frac{M g}{M+m+I / r^{2}}$
3. $\frac{M g}{M+m+2 I / r^{2}}$
4. $\frac{m g}{M+m+2 I / r^{2}}$

153 The angular momentum of a planet of mass $m$, moving around the sun (mass: $M \gg m$ ) in an orbit of radius $r$ is proportional to:

1. $m r$
2. $\frac{m}{r}$
3. $m \sqrt{r}$
4. $\frac{m}{\sqrt{r}}$

154 A triangular sheet of uniform thickness is shown in the figure. The co-ordinate of centre of mass is:


1. $(1 \mathrm{~m}, 3 \mathrm{~m})$
2. $(2 \mathrm{~m}, 3 \mathrm{~m})$
3. $(1 \mathrm{~m}, 2 \mathrm{~m})$
4. $(1.5 \mathrm{~m}, 3 \mathrm{~m})$

155 A homogenous disc with a radius of 0.2 m and mass of 5 kg rotates around an axis passing through its centre. The angular velocity of the rotation of the disc as a function of time is given by, $\omega=2+6 t$. The tangential force applied to the rim of the disc is:

1. 1 N
2. 2 N
3. 3 N
4. 4 N

156 Four point masses, each of value $m$, are placed at the corners, of a square ABCD of side $l$. The moment of inertia of this system about an axis passing through A and parallel to BD is:


1. $2 m l^{2}$
2. $\sqrt{3} m l^{2}$
3. $3 m l^{2}$
4. $m l^{2}$

157 A force $\vec{F}=4 \vec{i}-5 \hat{j}+3 \hat{k}$ is acting at point $\overrightarrow{r_{1}}=\hat{i}+2 \hat{j}+3 \hat{k}$. Then, the torque acting about point $\overrightarrow{r_{2}}=3 \hat{i}-2 \hat{j}-3 \hat{k}$ is:

1. zero
2. $42 \hat{i}-30 \hat{j}+6 \hat{k}$
3. $42 \hat{i}+30 \hat{j}+6 \hat{k}$
4. $42 \hat{i}+30 \hat{j}-6 \hat{k}$

158 All the particles of a body are situated at a distance $R$ from the origin. The distance of the centre of mass of the body from the origin is:

1. $=R$
2. $\leq R$
3. $>R$
4. $\geq R$

159 A stationary horizontal disc is free to rotate about its axis. When a torque is applied on it, its kinetic energy as a function of $\theta$, where $\theta$ is the angle by which it has rotated, is given as $k \theta^{2}$. If its moment of inertia is $I$, then the angular acceleration of the disc is:

1. $\frac{k}{I} \theta$
2. $\frac{k}{2 I} \theta$
3. $\frac{k}{4 I} \theta$
4. $\frac{2 k}{I} \theta$

160 Consider a uniform circular platform mounted on a fulcrum at its center of mass. Under which condition will angular momentum conservation of a platform not apply?

1. when the platform has zero angular velocity.
2. when the platform has a constant, non-zero angular 2. velocity.
3. when there are external torques on the platform.
4. when there are internal torques on the platform.

161 The moment of inertia of a semi-circular ring of mass $M$ and radius $R$ about an axis passing through centre and perpendicular to the plane of ring is:


1. $M R^{2}$
2. $\frac{1}{2} M R^{2}$
3. $2 M R^{2}$
4. $\frac{3}{4} M R^{2}$

162 The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is:

1. $1: \sqrt{2}$
2. $2: 1$
3. $\sqrt{2}: 1$
4. $4: 1$

163 Gravitational potential at the center of a solid sphere is $V$. Now radius of this sphere is made double its present value without changing its mass. Then the potential on the surface of this new sphere will be:

1. 2 V
2. $\frac{V}{2}$
3. 3 V
4. $\frac{V}{3}$

164 A heavy uniform rod is hanging vertically from a fixed support. It is stretched by its own weight. The diameter of the rod is:

1. smallest at the top and gradually increases down the rod.
largest at the top and gradually decreases down the rod.
2. uniform everywhere.
3. maximum in the middle.

165 Given below are two statements:
If the sun were to 'suddenly' be
Assertion (A): removed, then the earth would continue to move around in its orbit.
Angular momentum of a system of
Reason (R): particles is conserved when there is no external torque.

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true but $(\mathbf{R})$ is not the correct 2. explanation of (A).
3. (A) is true but $(\mathbf{R})$ is false.
4. (A) is false but ( $\mathbf{R}$ ) is true.

166 If $R$ is the radius of the earth and $g$ is the acceleration due to gravity on the earth surface. Then the mean density of the earth will be:

1. $\frac{\pi R G}{12 g}$
2. $\frac{3 \pi R}{4 g G}$
3. $\frac{3 g}{4 \pi R G}$
4. $\frac{4 \pi G}{3 g R}$

167 A rod is supported by two forces $F$ each as shown in the figure. The rod is in equilibrium, then:


1. the net torque about A is zero.
2. the net torque about $B$ is zero.
3. the net torque about C is zero.
4. all of these.

168 Given below are two statements:

| Assertion (A): | Angular momentum of an isolated <br> system of particles is conserved. |
| :--- | :--- |
| Reason (R): | The net torque on an isolated system of <br> particles is zero and the rate of change <br> of angular momentum equals the torque. |

Both (A) and (R) are true and $(\mathbf{R})$ is the correct explanation of (A).
Both (A) and (R) are true but ( $\mathbf{R}$ ) is not the correct explanation of (A).
3. (A) is true but (R) is false.
4. (A) is false but $(\mathbf{R})$ is true.

169 Select the correct option based on the statements given below:

If total energy of a satellite revolving
Statement I: around earth in circular path is $E$, then potential energy of satellite is $2 E$.
Statement II: Kinetic energy is also twice of total energy.

1. Statement I is incorrect and Statement II is correct.
2. Both Statement I and Statement II are correct.
3. Both Statement I and Statement II are incorrect.
4. Statement I is correct and Statement II is incorrect.

170 The rotational analouge of equation $F=\frac{m d v}{d t}$ is:

| 1. | $\tau=\frac{d L}{d t}$ |
| :--- | :--- |
| 2. | $\tau=I \frac{d \omega}{d t}$ |
| 3. | $\tau=I \frac{d I}{d t} \omega$ |
| 4. | $\tau=I \frac{d \omega}{d t}+\frac{d I}{d t} \omega$ |

171 Kepler's second law is based on:

## 1. Newton's first law

2. Newton's second law
3. Special theory of relativity
4. Conservation of angular momentum

172 Two balls are thrown simultaneously in the air. The acceleration of the centre of mass of the two balls while in the air:

1. depends on the direction of the motion of the balls.
2. depends on the masses of the two balls.
3. depends on the speeds of the two balls.
4. is equal to $g$.

173 Three equal masses each of mass $m$ are placed at the corners of an equilateral triangle of side $l$. The magnitude of gravitational force by this system on a mass $m$ placed at the mid-point of a side will be:

1. $\frac{2 G m^{2}}{3 l^{2}}$
2. $\frac{4 G m^{2}}{3 l^{2}}$
3. $\frac{8 G m^{2}}{\sqrt{3} l^{2}}$
4. $\frac{4 G m^{2}}{\sqrt{3} l^{2}}$

174 A large cylindrical piece of a dense solid elastic metal stands on its end as shown in the figure. The metal is uniform and isotropic. The stress in the material as a function of height is shown correctly by:


175 Mohit and Rahul are standing 10 m apart. They are holding a taut rope at one end each. To meet, each person pulls the rope until they meet when Rahul has moved 4 m from his starting position. If Mohit says his weight is 80 kg , then Rahul should say his weight as:
1.60 kg
2. 80 kg
3. 100 kg
4. 120 kg

176 A bob of mass $m$ attached to an inextensible string of length $l$ is suspended from a vertical support. The bob rotates in a horizontal circle with an angular speed $\omega$ $\mathrm{rad} / \mathrm{s}$ about the vertical. About the point of suspension:

1. angular momentum changes in magnitude but not in
2. direction.
3. angular momentum changes in direction but not in ${ }^{2}$. magnitude.
4. angular momentum changes in both direction and magnitude.
5. angular momentum is conserved.

177 If mass of a planet is 9 times that of the earth and radius is 2 times that of the earth, then the escape speed from this planet is:
( $v_{e}$ is escape speed from the Earth.)

1. $\frac{v_{e}}{\sqrt{2}}$
2. $\frac{v_{e}}{2 \sqrt{2}}$
3. $\frac{3 v_{e}}{\sqrt{2}}$
4. $\frac{v_{e}}{2}$

178 The moment of inertia of a uniform rod of mass $m$ and length $L$, about an axis passing through its center and making an angle $\theta$ with the rod is:


1. $\frac{m L^{2}}{12} \cos ^{2} \theta$
2. $\frac{m L^{2}}{12} \sin ^{2} \theta$
3. $\frac{m L^{2}}{12} \cos \theta$
4. $\frac{m L^{2}}{12} \sin \theta$

179 A metal wire is first stretched beyond its elastic limit and then released. It:

1. lost its elastic property completely and it will not 1. contract.
2. will contract to its original length.
3. will contract to its length at elastic limit.
4. will contract but the final length will be greater than 4. the original length.

180 A uniform solid wheel of mass $m$, radius $R$ encounters a rectangular step of height $h$. The torque of the weight $m g$, of the wheel, about the forward edge of the step (A) is (in magnitude):


1. $m g R$
2. $m g(R-h)$
3. $m g h$
4. $m g \sqrt{h(2 R-h)}$

181 A 1-kg Moon rock is weighed on the surfaces of both the Earth and the Moon. The acceleration due to gravity is six times greater on the Earth than on the Moon. What is the ratio of the mass of the rock on the Earth to the mass of the rock on the Moon?

1. $6: 1$
2. $\sqrt{6}: 1$
3. $1: 1$
4. it cannot be determined from the information given

182 A particle is made to move in circular path with decreasing speed. Which of the following is correct?

1. angular momentum is constant.
2. only the direction of angular momentum $(\vec{L})$ is constant.
3. acceleration is always directed towards the centre.
4. the particle moves in a spiral path.

183 A uniform $\operatorname{rod} A B$ of mass m and length $L$ is replaced by three particles - two particles of masses $m_{1}$ each at the ends and another particle of mass $m_{2}$ at its centre. The new system of particles has the same total mass, the same center-of-mass and the same moment of inertia about an axis through its C.M. and perpendicular to $A B$.
Which of the following is true?


| 1. | $m_{1}=\frac{m}{3}, m_{2}=\frac{m}{3}$ |
| :--- | :--- |
| 2. | $m_{1}=\frac{m}{4}, m_{2}=\frac{m}{2}$ |
| 3. | $m_{1}=\frac{m}{6}, m_{2}=\frac{2 m}{3}$ |
| 4. | $m_{1}=\frac{m}{5}, m_{2}=\frac{3 m}{5}$ |

184 Which of the following graphs correctly represents the variation of acceleration due to gravity $g$ with distance $r$ from the center of the earth? (where $R$ is the radius of the earth)


185 A particle is released from a height equal to radius of earth, $R$. Its velocity when it strikes the ground is:

1. $\sqrt{g R}$
2. $\sqrt{\frac{g R}{2}}$
3. $\sqrt{2 g R}$
4. $\sqrt{4 g R}$

## Physics - Section B

186 Given below are two statements:
The stream of water flowing at high speed from a garden hose, and pipe
Assertion (A): tends to spread like a fountain when held vertically up but tends to narrow down when held vertically down.
In any steady flow of an incompressible
Reason (R):
fluid, the volume flow rate of the fluid remains constant.

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true but (R) is not the correct explanation of (A).
3. (A) is true but ( $\mathbf{R}$ ) is false.
4. Both (A) and (R) are false.

187 The coefficient of viscosity $\eta$ of a liquid is defined as the tangential force on a layer in that liquid per unit area per unit velocity gradient across it. Then a sphere of radius $a$, moving through it under viscous force $F$ attains a constant velocity $v$ given by: (where $K$ is a numerical constant)

1. KFaך
2. $\frac{K F \eta}{a}$
3. $\frac{K F}{a \eta}$
4. $\frac{K a \eta}{F}$

188 Given below are two statements:

| Assertion (A): | When toothpaste is pressed, it follows <br> Pascal's principle. |
| :--- | :--- |
| Reason (R): | When pressure is applied on a fluid it is <br> distributed constantly throughout the <br> fluid in all directions and on the wall of <br> the container. |

Both (A) and (R) are true and (R) is the correct explanation of $(\mathbf{A})$.
Both (A) and (R) are true but (R) is not the correct explanation of $(\mathbf{A})$.
3. (A) is true but (R) is false.
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are false.

189 The velocity of water in a river is:

1. same everywhere.
2. more in the middle and less near its banks.
3. less in the middle and more at banks.
4. increases from one bank to other.

190 A solid sphere of radius $r$ made of a soft material of bulk modulus $K$ is surrounded by a liquid in a cylindrical container. A massless piston of area $a$ floats on the surface of the liquid, covering the entire crosssection of the cylindrical container. When a mass $m$ is placed on the surface of the piston to compress the liquid, the fractional decrement in the radius of the sphere, $\left(\frac{d r}{r}\right)$ is:

1. $\frac{K a}{m g}$
2. $\frac{K a}{3 m g}$
3. $\frac{m g}{3 K a}$
4. $\frac{m g}{K a}$

191 A ball of mass $m$ and radius $r$ and density $\rho$ is dropped in a liquid of density $\rho_{0}$. After moving for some time, the speed of the ball becomes constant, equal to $v_{0}$. The coefficient of viscosity of the liquid is:

1. $\frac{m g}{6 \pi r v_{0}}\left(1-\frac{\rho_{0}}{\rho}\right)$
2. $\frac{m g}{6 \pi r v_{0}}\left(1+\frac{\rho_{0}}{\rho}\right)$
3. $\frac{m g}{3 \pi r v_{0}}\left(1+\frac{\rho_{0}}{\rho}\right)$
4. $\frac{m g}{3 \pi r v_{0}}\left(1-\frac{\rho_{0}}{\rho}\right)$

192 A fluid is flowing through a horizontal pipe of varying cross-sections, with speed $v \mathrm{~ms}^{-1}$ at a point where the pressure is $P$ pascal. At another point where pressure is $\frac{P}{2}$ pascal, its speed is $V \mathrm{~ms}^{-1}$. If the density of the fluid is $\rho \mathrm{kg}-\mathrm{m}^{-3}$ and the flow is streamlined, then $V$ is equal to:

1. $\sqrt{\frac{P}{2 \rho}+v^{2}}$
2. $\sqrt{\frac{P}{\rho}+v^{2}}$
3. $\sqrt{\frac{2 P}{\rho}+v^{2}}$
4. $\sqrt{\frac{P}{\rho}+v}$

193 A ball of mass $m$ and radius $r$ is released in a viscous liquid. The value of its terminal velocity is proportional to:

1. $\frac{1}{r}$ only
2. $\frac{m}{r}$
3. $\left(\frac{m}{r}\right)^{1 / 2}$
4. $m$ only

194 Water is flowing inside the conical type tube having a ratio of area of cross-section $6: 1$. If the speed of the water outlet through a smaller area is $60 \mathrm{~m} / \mathrm{s}$, then the pressure difference across these two cross-sections is:
(Assume incompressible fluid, density of water $=1000$ $\mathrm{kg} / \mathrm{m}^{3}$ )


1. $175 \times 10^{4} \mathrm{~Pa}$
2. $175 \times 10^{3} \mathrm{~Pa}$
3. $250 \times 10^{4} \mathrm{~Pa}$
4. $250 \times 10^{3} \mathrm{~Pa}$

195 Wire A and B have their young's modulii in the ratio $1: 3$ area of cross-section in the ratio of $1: 2$ and lengths in ratio of $3: 4$. If same force is applied on the two wires to elongate then ratio of elongation is equal to:

1. $8: 1$
2. $1: 12$
3. $1: 8$
4. $9: 2$

196 A typical human head has the approximate shape of a cylinder of diameter of 0.2 m and height 0.3 m . If the pressure of the atmosphere is $1.01 \times 10^{5} \mathrm{~N} / \mathrm{m}^{2}$, let $F_{\text {atm }}$ be the force acting down on a human head due to the atmosphere. How many kilograms taken together would weight $F_{\text {atm }}$ ? (Take $g=10 \mathrm{~m} / \mathrm{s}^{2}$ )

1. 12
2. 94
3. 320
4. 1300

197 When water droplets merge to form a bigger drop:

1. energy is liberated.
2. energy is absorbed.
3. energy is neither liberated nor absorbed.
4. energy may either be liberated or absorbed depending on the nature of the liquid.

198 In the adjacent figure, pressure inside the piston is $P$, and the height of water in the capillary is $h$. Now if the pressure $P$ is increased, choose the correct graph from the following.


199 The ratio of surface tensions of mercury and water is given to be $7.5: 1$ while the ratio of their densities is 13.6: 1 Their contact angles, with glass, are close to $135^{\circ}$ and $0^{\circ}$, respectively. It is observed that mercury gets depressed by an amount $h$ in a capillary tube of radius $r_{1}$, while water rises by the same amount $h$ in a capillary tube of radius $r_{2}$. The ratio $\frac{r_{1}}{r_{2}}$, is then close to:

1. $\frac{2}{3}$
2. $\frac{4}{5}$
3. $\frac{2}{5}$
4. $\frac{3}{5}$

200 A cubical block of side 0.5 m floats on water with $30 \%$ of its volume under water. What is the maximum weight that can be put on the block without fully submerging it underwater?
(Take, density of water $=10^{3} \mathrm{~kg} / \mathrm{m}^{3}$ )
1.30 .1 kg
2. 87.5 kg
3. 65.4 kg
4. 46.3 kg

## Fill OMR Sheet*

*If above link doesn't work, please go to test link from where you got the pdf and fill OMR from there. After filling the OMR, you would get answers and explanations for the questions in the test.

