



# MEDICAL DIVISION

# **VIBRANT ACADEMY**

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## **SAMPLE PAPER**

### **SEAT (SCHOLARSHIP CUM EARLY ADMISSION TEST)** **XI TO XII MOVING (STEM COURSE)**

Time : 1 Hours

Maximum Marks : 200

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

### **INSTRUCTIONS**

#### **A. General :**

1. This booklet is your Question Paper containing **50** questions. The booklet has **24** pages.
2. The **question paper CODE** is printed on the right hand top corner of this sheet and on the back page (page no. **24**) of this booklet.
3. The question paper contains **2** blank pages for your rough work. No additional sheets will be provided for rough work.
4. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
5. Fill in the boxes provided below on this page and also write your **Name** and **Regn. No.** in the space provided on the back page (page no. **24**) of this booklet.
6. The answer sheet, a machine-readable Objective Response Sheet (**ORS**), is provided separately.
7. **DO NOT TAMPER WITH / MUTILATE THE ORS OR THE BOOKLET.**
8. Do not open the question-paper booklet before being instructed to do so by the invigilators.

#### **B. Question paper format**

Read the instructions printed on the back page

#### **C. Marking scheme**

(page no. **24**) of this booklet.

Name of the candidate

UID Number

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I have read all the instructions and shall abide by them.

I have verified all the information filled in by the candidate.

.....  
Signature of the Candidate

.....  
Signature of the invigilator

#### **USEFUL DATA**

Atomic weights: Al = 27, Mg = 24, Cu = 63.5, Mn = 55, Cl = 35.5, O = 16, H = 1, P = 31, Ag = 108, N = 14, Li = 7, I = 127, Cr = 52, K=39, S = 32, Na = 23, C = 12, Br = 80, Fe = 56, Ca = 40, Zn = 65.5, Ti = 48, Ba = 137, U = 238, Co= 59, B =11, F = 19, He = 4, Ne = 20, Ar = 40 , Mo = 96, g = 10 m/s<sup>2</sup>

**PART I : PHYSICS**  
**Single Correct Choice Type**

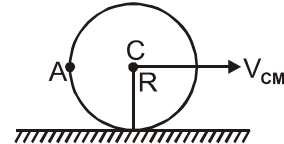
This section contains 15 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** is correct.

1. Two springs have their force constants in the ratio 3 : 4. Both the springs are stretched by applying equal force F. If elongation in first spring is x then elongation in second spring is

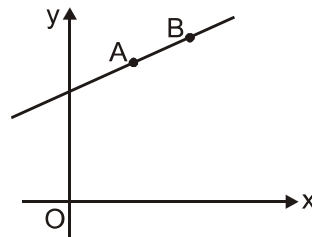
(1) 3x                      (2) 4x                      (3)  $\frac{4}{3}x$                       (4)  $\frac{3}{4}x$

2. In case of pure rolling, what will be the velocity of point A of the ring of radius R?

(1)  $V_{CM}$                       (2)  $\sqrt{2} V_{CM}$   
(3)  $\frac{V_{CM}}{2}$                       (4)  $2 V_{CM}$



3. A particle of mass M moves in the xy plane with a velocity v along the straight line AB. If the angular momentum of the particle with respect to origin O is  $L_A$  when it is at A and  $L_B$  when it is at B, then



(1)  $L_A < L_B$   
(2)  $L_A > L_B$   
(3)  $L_A = L_B$   
(4) The relationship between  $L_A$  and  $L_B$  depends upon the slope of the line AB.

4. If the angle between the vectors  $\vec{A}$  and  $\vec{B}$  is  $\theta$ , the value of the product  $(\vec{B} \times \vec{A}) \cdot \vec{A}$  is equal to

(1)  $BA^2 \sin \theta$                       (2)  $BA^2 \cos \theta$   
(3)  $BA^2 \sin \theta \cos \theta$                       (4) Zero

5. A body constrained to move along z-axis, under a constant force  $\vec{F} = -\hat{i} + 2\hat{j} + 3\hat{k}$  N. Work done by this force in moving the body a distance 4 m along the z-axis is

(1) 12 J                      (2) 4 J                      (3) 2 J                      (4) 6 J

6. Two identical balls each of mass 4 kg are moving towards each other with speeds 2 m/s and 3 m/s respectively. They undergo head on perfectly elastic collision. Then impulse imparted by one ball on other is

(1) 12 Ns                      (2) 8 Ns                      (3) 20 Ns                      (4) 40 Ns

7. The potential energy of a system increases if work is done

(1) Upon the system by a conservative force                      (2) Upon the system by a nonconservative force  
(3) By the system against a conservative force                      (4) By the system against a non conservative force

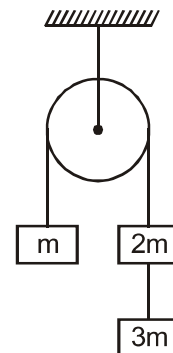
8. A body rotates about a fixed axis with an angular acceleration  $3 \text{ rad/s}^2$ . The angle rotated by it during the time when its angular velocity increases from  $10 \text{ rad/s}$  to  $20 \text{ rad/s}$  (in radian) is  
 (1) 50 (2) 100 (3) 150 (4) 200
9. Due to global warming, ice on polar caps is likely to melt in larger quantity. Due to this effect  
 (1) Moment of inertia of earth shall decrease (2) Length of the day shall decrease  
 (3) Angular velocity of earth shall decrease (4) Angular momentum of earth shall decrease
10. Four thin uniform rods each of length  $L$  and mass  $M$  are joined to form a square. The moment of inertia of square about an axis along its one diagonal is  
 (1)  $\frac{ML^2}{6}$  (2)  $\frac{2}{3}ML^2$  (3)  $\frac{3}{4}ML^2$  (4)  $\frac{4}{3}ML^2$
11. A ball projected from ground vertically upwards is at same height at time  $t_1$  and  $t_2$ . The speed of projection of ball is (Neglect the effect of air resistance)  
 (1)  $g[t_2 - t_1]$  (2)  $g\frac{(t_1 + t_2)}{2}$  (3)  $g\frac{(t_2 - t_1)}{2}$  (4)  $g(t_1 + t_2)$
12. If average velocity of particle moving on a straight line is zero in a time interval, then  
 (1) Acceleration of particle may be zero  
 (2) Velocity of particle must be zero at an instant  
 (3) Velocity of particle may be never zero in the interval  
 (4) Average speed of particle may be zero in the interval
13. Internal force acting within a system of particles can alter  
 (1) The linear momentum as well as the kinetic energy of the system  
 (2) The linear momentum of the system, but not the kinetic energy of the system  
 (3) The kinetic energy of the system, but not the linear momentum of the system  
 (4) Neither linear momentum nor kinetic energy of the system
14. In the figure given below, with what acceleration does the block of mass  $m$  will move?  
 (Pulley and strings are massless and frictionless)

(1)  $\frac{g}{3}$

(2)  $\frac{2g}{5}$

(3)  $\frac{2g}{3}$

(4)  $\frac{g}{2}$

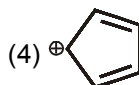
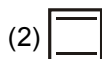
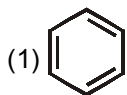


15. When a force of constant magnitude and a fixed direction acts on a moving object, then its path is  
 (1) Circular (2) Parabolic (3) Straight line (4) Either (2) or (3)

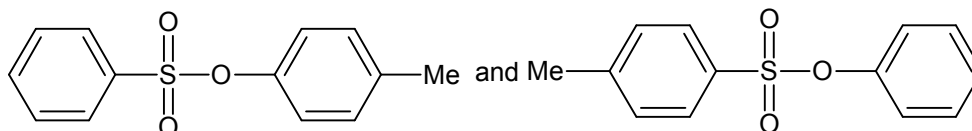
**PART II : CHEMISTRY**  
**Single Correct Choice Type**

This section contains 15 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** is correct.

16. For the gas phase reaction,  $2\text{NO} \rightleftharpoons \text{N}_2 + \text{O}_2$ ;  $\Delta H = -43.5 \text{ kcal mol}^{-1}$ , which one of the statements below is true for  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
- (1) K is independent of T  
(2) K increases as T decreases  
(3) K decreases as T decreases  
(4) K varies with the addition of NO
17. Which of the following molecules is aromatic?



18. Which is expected to have the highest third ionization enthalpy?
- (1) Vanadium (Z = 23)  
(2) Manganese (Z = 25)  
(3) Chromium (Z = 24)  
(4) Iron (Z = 26)
19. Increasing the temperature of an aqueous solution will cause :
- (1) decrease in molarity  
(2) decrease in molality  
(3) decrease in mole fraction  
(4) decrease in % (w/w)
20. Isomerism shown by



- (1) Chain isomerism  
(2) Positional isomerism  
(3) Metamerism  
(4) Functional group isomerism
21. 13.5 g of aluminium when changes to  $\text{Al}^{+3}$  ion in solution, will lose
- (1)  $18.0 \times 10^{23}$  electrons  
(2)  $6.022 \times 10^{23}$  electrons  
(3)  $3.01 \times 10^{23}$  electrons  
(4)  $9.1 \times 10^{23}$  electrons
22. Which of the following acid is solid at room temperature.
- (1)  $\text{H}_3\text{BO}_3$                       (2)  $\text{H}_2\text{SO}_4$                       (3)  $\text{HNO}_3$                       (4)  $\text{HCl}$
23. Nitrogen atom has three unpaired electrons because of :
- (1) Hund's rule  
(2) Uncertainty principle  
(3) Pauli's Exclusion principle  
(4) Aufbau principle
24. Which of the following substituents will decrease the acidity of phenol
- (1)  $-\text{NO}_2$                       (2)  $-\text{CN}$                       (3)  $-\text{CHO}$                       (4)  $-\text{CH}_3$

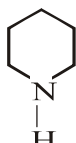
25. An ideal gas cannot be liquified because :
- (1) its critical temperature is always above 0°C
  - (2) its molecules are relatively smaller in size
  - (3) it solidifies before becoming a liquid
  - (4) forces among the molecules are negligible
26. Solid with low melting point is :
- (1) Ionic solid
  - (2) Metallic solid
  - (3) Molecular solid
  - (4) Covalent solid
27. Which of the following statement is false?
- (1) Work is a state function
  - (2) Temperature is a state function
  - (3) Change of state is completely defined when initial and final states are specified.
  - (4) Work appears at the boundary of the solution

28. The correct order of decreasing basic strength is :



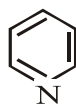
I

(1) I > II > III > IV



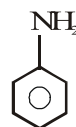
II

(2) II > III > I > IV



III

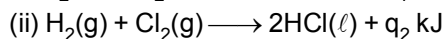
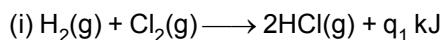
(3) II > IV > I > III



IV

(4) II > III > IV > I

29. For the reactions :



Which one of the following statement is correct?

(1)  $q_1 > q_2$

(2)  $q_1 < q_2$

(3)  $q_1 + q_2 = 0$

(4)  $q_1 = q_2$

30. Which substance has the strongest London dispersion forces?

(1)  $\text{SiH}_4$

(2)  $\text{CH}_4$

(3)  $\text{SnH}_4$

(4)  $\text{GeH}_4$

**PART III : BIOLOGY**  
**Single Correct Choice Type**

This section contains 15 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** is correct.

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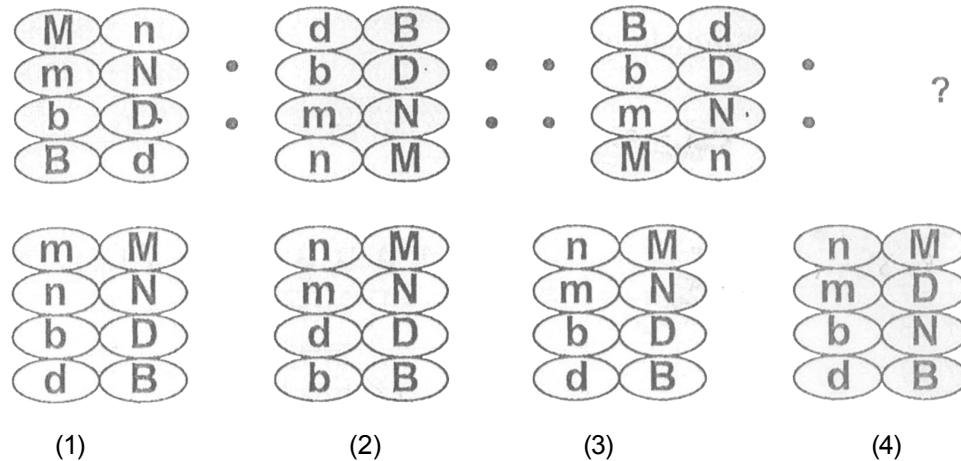
31. In fluid mosaic model, the plasma membrane has :
- (1) A central bilayer of proteins (2) A bilayer of phospholipids  
(3) Hydrophobic heads (4) Hydrophilic tails
32. Match the following with correct explanation :
- | Column-I                    | Column-II                           |
|-----------------------------|-------------------------------------|
| (A) Endoplasmic reticulum   | (1) Stack of cisternae              |
| (B) Spherosome              | (2) Store oils or fats              |
| (C) Dictyosomes             | (3) Synthesis and storage of lipids |
| (D) Peroxisome              | (4) Photorespiration                |
| (E) Elaioplasts             | (5) Detoxification of drugs         |
| (1) A-5, B-3, C-1, D-4, E-2 | (2) A-5, B-3, C-2, D-4, E-1         |
| (3) A-2, B-3, C-1, D-4, E-5 | (4) A-4, B-3, C-1, D-5, E-2         |
33. Parotid salivary gland are present :
- (1) Below the tongue (2) Below the ear  
(3) Below the eye orbit (4) In the angle between two jaws
34. Which one of these is not a eukaryote ?
- (1) *Euglena* (2) *Anabaena* (3) *Spirogyra* (4) *Agaricus*
35. An animal which comes out at night and hides during day time is :
- (1) Diurnal (2) Nocturnal (3) Cursorial (4) Arboreal
36. Ptyalin is :
- (1) Strongly acidic (2) Slightly acidic (3) Slightly neutral (4) Strongly alkaline
37. Agar - agar is obtained from :
- (1) *Gigartina* (2) *Gelidium* (3) *Gracilaria* (4) All of the above
38. Birds and mammals share one of the following characteristics as a common feature :
- (1) Pigmented skin (2) Alimentary canal with some modification  
(3) Viviparity (4) Warm blooded nature
39. Venation is a term used to describe the pattern of arrangement of :
- (1) Floral organs (2) Flower in inflorescence  
(3) Veins and veinletes in a lamina (4) All of them
40. Most appropriate term to designate the life cycle of *Obelia* is :
- (1) Neoteny (2) Metagenesis  
(3) Metamorphosis (4) None of these
41. The rate of transpiration will be very less in a situation where :
- (1) Ground water is sufficiently available (2) Wind is blowing  
(3) Environment is very hot and dry (4) Relative humidity is very high

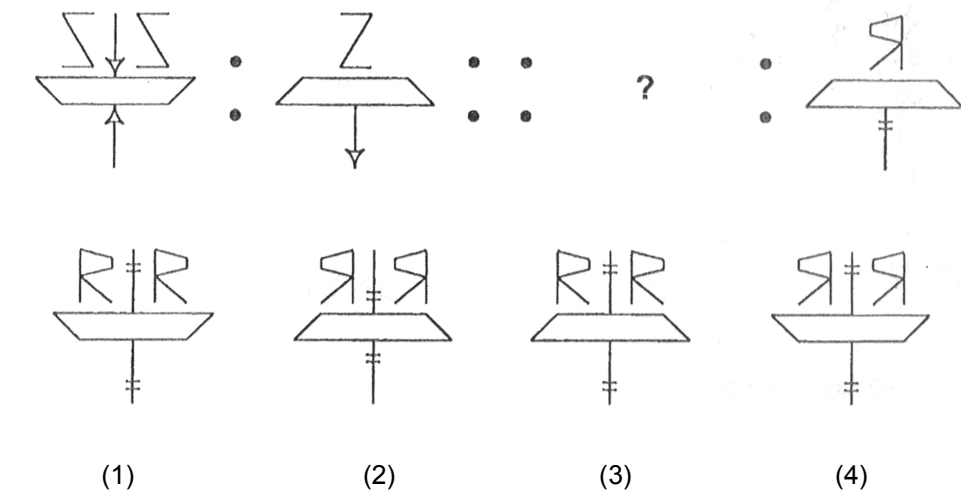
42. Oxygen carrying capacity of human blood is reduced due to the pollution of :  
 (1) CO<sub>2</sub>                      (2) CO                      (3) SO<sub>2</sub>                      (4) O<sub>3</sub>
43. When chemical fertilisers are supplied to a plant without supplying sufficient water, the plant shows wilting because :  
 (1) The plant cannot absorb the fertilisers                      (2) The plant absorbs more fertilisers  
 (3) Of plasmolysis occurring in root cells                      (4) The fertiliser absorbs all available water in the soil
44. Digestion of both starch and protein is done by :  
 (1) Gastric juice                      (2) Gastric lipase  
 (3) Pancreatic juice                      (4) Ptyalin
45. Common bath sponge is :  
 (1) *Spongilla*                      (2) *Euspongia*  
 (3) *Leucosolenia*                      (4) *Sycon*

**PART IV : MENTAL ABILITY**  
**Single Correct Choice Type**

This section contains 5 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** is correct.

**Directions (Q. 46 to Q. 47) :** In the following questions, there is a relationship between the two numbers/letters/figures on the left of the sign (: :). The same relationship exists between the two to the right of the sign (: :), of which one is missing. Find the missing one from the alternatives.

46. 

47. 

**Directions : (Q. 48 to 50)** The words are given under column-I. Their codes are given under column-II with out following the same order as in column-I. Find the codes for the letters of words in column-I and find the codes for the given words in the questions.

**Column-I**

DIM  
PAID  
MALE  
PROOF  
ANGER  
FEAST  
GRAPE  
STRONG

**Column-II**

y h e  
s h e w  
i b s y  
u d u c w  
d o b z s  
s x c b j  
b s d o w  
x z u o j d

48. DRAFT  
(1) s c x e d                      (2) e d s c x                      (3) x s d c e                      (4) c x e d s
49. SMILE  
(1) y b j b h                      (2) h i b y j                      (3) j y h i b                      (4) b h y j i
50. INMATE  
(1) x y z h b s                      (2) y s h b z x                      (3) b x s z h y                      (4) h z y s x b

**Name of the candidate**

**UID Number**

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**B. Question paper format :**

9. The question paper consists of 4 parts (Physics, Chemistry, Biology and Mental).
10. Section-I, II & III in **15** multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **only one is correct**.
11. Section-IV in **5** multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **only one is correct**.

**C. Marking Scheme :**

12. For each question, you will be **awarded 4 marks** if you darken the bubble corresponding to the correct answer and **zero mark** if no bubble is darkened. In case of bubbling of incorrect answer, **minus one (-1) mark** will be awarded.

**ANSWER KEY**

- |     |   |     |   |     |   |     |   |     |   |     |   |     |   |
|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|
| 1.  | 4 | 2.  | 2 | 3.  | 3 | 4.  | 4 | 5.  | 1 | 6.  | 3 | 7.  | 3 |
| 8.  | 1 | 9.  | 3 | 10. | 2 | 11. | 2 | 12. | 2 | 13. | 3 | 14. | 3 |
| 15. | 4 | 16. | 3 | 17. | 1 | 18. | 2 | 19. | 1 | 20. | 3 | 21. | 4 |
| 22. | 1 | 23. | 1 | 24. | 4 | 25. | 4 | 26. | 3 | 27. | 1 | 28. | 4 |
| 29. | 2 | 30. | 3 | 31. | 2 | 32. | 1 | 33. | 2 | 34. | 2 | 35. | 2 |
| 36. | 2 | 37. | 4 | 38. | 4 | 39. | 3 | 40. | 2 | 41. | 4 | 42. | 2 |
| 43. | 3 | 44. | 3 | 45. | 2 | 46. | 3 | 47. | 1 | 48. | 2 | 49. | 3 |
| 50. | 4 |     |   |     |   |     |   |     |   |     |   |     |   |