

**SAMPLE PAPER - 39**

Time : 1 : 15 Hr.

Question : 60

**PHYSICS**

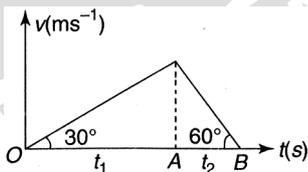
01. A man moves on his motorbike with 54 km/h and then takes a U-turn and continues to move with same speed. The time of U-turn is 10 s. Find the magnitude of average acceleration during U-turn

(1) 0 (2)  $3 \text{ ms}^{-2}$   
 (3)  $1.5\sqrt{2} \text{ ms}^{-2}$  (4) none of these

02. A body is projected vertically downwards from A, the top of the tower reaches the ground in  $t_1$  seconds. If it is projected upwards with same speed, it reaches the ground in  $t_2$  seconds. At what time will it reach the ground if it is dropped from A ?

(1)  $\sqrt{t_1/t_2}$  (2)  $\sqrt{t_2/t_1}$   
 (3)  $\sqrt{t_1 t_2}$  (4)  $t_1 t_2$

03. The velocity time graph of a body moving along a straight line is shown in figure. The ratio of the average velocities during the time  $t_1$  and  $t_2$  is



(1) 1 : 1 (2) 2 : 1  
 (3) 3 : 1 (4) 1 : 3

04. An object moving with a speed of 6.25 m/s, is decelerated at a rate given by :

$$\frac{dv}{dt} = -2.5\sqrt{v};$$

where  $v$  is instantaneous speed. The time taken by the object, to come to rest, would be :

(1) 1 s (2) 2 s  
 (3) 4 s (4) 8 s

05. A fighter plane is flying horizontally at an altitude of 1.5 km with speed  $720 \text{ km h}^{-1}$ . At what angle of sight (w.r.t. horizontal) when the target is seen, should the pilot drop

the bomb in order to attack the target ?  
 (Take  $g = 10 \text{ ms}^{-2}$ )

(1)  $\tan^{-1}\left(\frac{\sqrt{3}}{4}\right)$  (2)  $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$   
 (3)  $\tan^{-1}\left(\frac{1}{2}\right)$  (4)  $\tan^{-1}(2)$

06. For a particle performing uniform circular motion, choose the incorrect statement from the following

(1) Magnitude of particle velocity (speed) remains constant  
 (2) Particle velocity remains directed perpendicular to radius vector  
 (3) Direction of acceleration keeps changing as particle moves  
 (4) Magnitude of acceleration does not remain constant

07. The length of second's hand in a watch is 1 cm. The change in velocity of its tip in 15 seconds is

(1) Zero (2)  $\frac{\pi}{30\sqrt{2}} \text{ cm/s}$   
 (3)  $\frac{\pi}{30} \text{ cm/s}$  (4)  $\frac{\pi\sqrt{2}}{30} \text{ cm/s}$

08. Which of the following conclusions is correct regarding a stationary body ?

(1) No force is acting on the body  
 (2) Vector sum of forces acting on the body is zero  
 (3) The body is in vacuum  
 (4) The forces acting on the body, do not constitute a couple

09. For a planet moving around the sun in an elliptical orbit:

(1) The torque acting on planet about the sun is non-zero  
 (2) The angular momentum of planet about the sun is constant  
 (3) The areal velocity of planet about the sun is not constant  
 (4) Planet moves with a constant speed around the sun

# CHEMISTRY

10. The escape velocity from earth is  $v_{es}$ . If the mass of a certain planet is 3 times and radius 3 times that of earth, then the escape velocity from the planet will be.

- (1)  $3v_{es}$     (2)  $6v_{es}$     (3)  $\sqrt{3} v_{es}$     (4)  $v_{es}$

11. For a satellite to be geostationary, which of the following are essential conditions?

- (1) It must always be stationed above the equator  
 (2) It must rotate from west to east  
 (3) It must be about 36000 km above the earth surface  
 (4) All the above

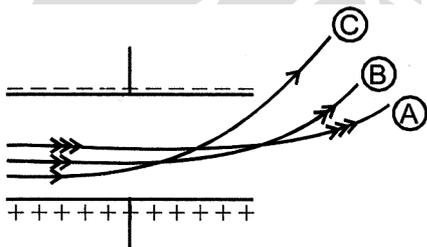
12. Two masses  $m_1 = 2$  kg and  $m_2 = 8$  kg infinite distance apart are initially at rest. Under their mutual gravitational attraction they start moving. When the separation between them becomes 1 m, their relative velocity of approach will be

- (1)  $\sqrt{10G}$     (2)  $\sqrt{20G}$     (3)  $\sqrt{\frac{16G}{5}}$     (4)  $\sqrt{\frac{16G}{3}}$

13. The electric field at a distance  $\frac{3R}{2}$  from the centre of a charged conducting spherical shell of radius R is E. The electric field at a distance  $\frac{R}{2}$  from the centre of the sphere is

- (1) Zero    (2) E  
 (3)  $\frac{E}{2}$     (4) 2E

14. Three particles are projected in a uniform electric field with same velocity perpendicular to the field as shown. Which particle has highest charge to mass ratio ?



- (1) A  
 (2) B  
 (3) C  
 (4) All have same charge to mass ratio

15. The breakdown electric field of air is about  $2 \times 10^6$  V/m. The maximum charge that can be placed on a sphere of diameter 10 cm is

- (1)  $2 \times 10^{-4}$  C  
 (2)  $5.6 \times 10^{-7}$  C  
 (3)  $5.6 \times 10^{-2}$  C  
 (4)  $2 \times 10^{+2}$  C

16. The flask A and B of equal size contain 2 g of  $H_2$  and 2 g of  $N_2$  respectively at the same temperature. The number of molecules in flask A is

- (1) same as those in flask B  
 (2) less than those in flask B  
 (3) greater than those in flask B  
 (4) exactly half than those in flask B

17. Simplest formula of compound containing 50% of element X (at. mass 10) and 50% of element Y (at. mass 20) is

- (1) XY    (2)  $X_2Y$   
 (3)  $XY_2$     (4)  $X_2Y_3$

18.  $2H_2 + O_2 \rightarrow 2H_2O$

2g  $H_2$  and 1  $O_2$  react to form  $H_2O$   
 (1) 3.0 g    (2) 1.125 g  
 (3) 4.5 g    (4) 2.50 g

19. The molarity of a solution obtained by mixing 750 mL of 0.5 M HCl with 250 mL of 2 M HCl will be

- (1) 0.875 M    (2) 1.00 M  
 (3) 1.25 M    (4) 2.5 M

20. 8g of NaOH is dissolved in 18g of  $H_2O$ . Mole fraction of NaOH in solution and molality (in mol  $kg^{-1}$ ) of the solutions respectively are

- (1) 0.167, 11.11    (2) 0.2, 22.20  
 (3) 0.2, 11.11    (4) 0.167, 22.20

21. The correct decreasing order for acid strength is

- (1)  $NCCH_2COOH > O_2NCH_2COOH > FCH_2COOH > ClCH_2COOH$   
 (2)  $FCH_2COOH > NCCH_2COOH > O_2NCH_2COOH > ClCH_2COOH$   
 (3)  $O_2NCH_2COOH > FCH_2COOH > NCCH_2COOH > ClCH_2COOH$   
 (4)  $O_2NCH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$

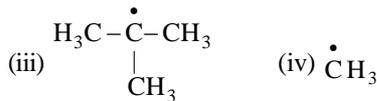
22. In which of the following molecule, the group attached to benzene does not show any type of resonance effect?

- (1)    (2)   
 (3)    (4)

23. The inductive effects of the group  $-CH_3$ ,  $-COO^-$ ,  $-Br$ ,  $-\overset{+}{N}H_3$  respectively are

- (1) +I, -I, +I, +I    (2) -I, +I, -I, +I  
 (3) -I, -I, +I, +I    (4) +I, +I, -I, -I

24. The stability of given free radicals in decreasing order is

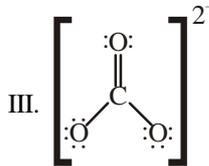


- (1) III > IV > I > II      (2) I > II > III > IV  
 (3) III > II > IV > I      (4) III > II > I > IV

25. The number of cyclic structural isomers are possible for molecular formula  $\text{C}_4\text{H}_6$ ?

- (1) 3      (2) 2  
 (3) 5      (4) 6

26. Which of the following structure is/are correct



- (1) Only (I)      (2) Only (II)  
 (3) II and III      (4) All (I), (II) and (III)

27. Condition for ionic bond.

- (1) One atom have low I.P. other have high I.P.  
 (2) One atom have low I.P. other have low electron affinity  
 (3) One atom have high I.P. other have high electron gain enthalpy  
 (4) One atom have low I.P. other have more negative electron gain enthalpy.

28. Which of the following not an actinoid

- (1) Terbium (Z=65)  
 (2) Thorium (Z=90)  
 (3) Berkelium (Z=97)  
 (4) Nobelium (102)

29. Which set of atomic number represent representative elements.

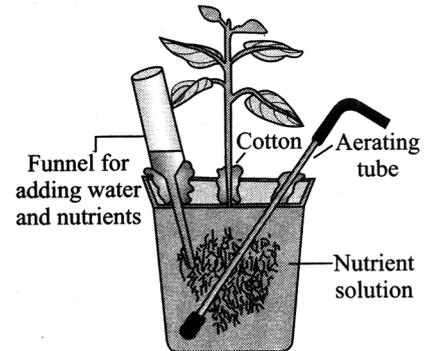
- (1) 25, 30, 45, 42  
 (2) 8, 15, 18, 13  
 (3) 102, 92, 96, 100  
 (4) 78, 16, 63, 12

30. The first ionisation enthalpy values of the III period elements Na, Mg, Si are respectively 496, 737 and 786 KJ/mole. The first  $\Delta H_i$  value for Al will be more close to

- (1) 496      (2) 760  
 (3) 786      (4) 575

## BOTANY

31. The following figure shows the typical set-up for



- (1) Demonstration of osmosis  
 (2) Thistle funnel experiment  
 (3) Nutrient solution culture  
 (4) Sachs technique for water less culture

32. Match the column I and column II and select the correct combination.

Column-I		Column-II	
A.	Carbohydrate translocation	i.	Iron
B.	Component of vitamins (biotin and thiamine)	ii.	Phosphorus
C.	Synthesis of cell wall	iii.	Boron
D.	Component of cytochromes	iv.	Sulphur
E.	Phosphorylation reactions	v.	Calcium

- (1) A-v, B-iv, C-ii, D-iii, E-i  
 (2) A-iii, B-iv, C-v, D-i, E-ii  
 (3) A-v, B-iv, C-ii, D-i, E-iii  
 (4) A-iii, B-i, C-v, D-iv, E-ii

33. The prominent symptom of manganese toxicity is the appearance of

- (1) Chlorotic veins surrounded by black spots  
 (2) Chlorotic veins surrounded by brown spots  
 (3) Brown spots surrounded by chlorotic veins  
 (4) Black spots surrounded by chlorotic veins

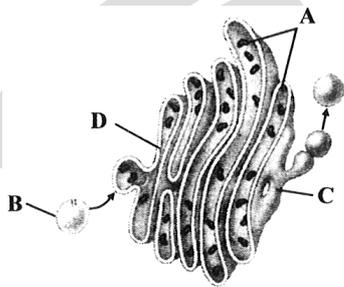
34. Essential elements are often supplied to the crop plants through fertilizers. The components of fertilizers are

- (1) Micro-nutrients (Cu, Zn, Fe, Mn etc.)  
 (2) Macro-nutrients (N, P, K, S etc.)  
 (3) Both (1) and (2)  
 (4) Na, Se, Si, Co

35. Find out the incorrect statement.

- (1) Azotobacter and Beijernickia are aerobic, free living nitrogen fixing micorbes  
 (2) Rhodospirillum and Bacilus polymyxa are anaerobic, free-living bacteria  
 (3) Rhizobium and Frankia are symbiotic  $\text{N}_2$  fixers in legumes  
 (4) Cyanobacteria (Nostoc and Anabaena) are free living  $\text{N}_2$  fixers.

36. Plant (internal) factor(s) that affect transpiration include(s)  
 (1) Number and distribution of stomata  
 (2) Percent of open stomata  
 (3) Canopy structure and water status of the plant  
 (4) All of the above
37. A first action spectrum of photosynthesis was described by  
 (1) Julius von Sachs  
 (2) Cornelius van Niel  
 (3) T.W. Engelmann  
 (4) Jan Ingenhousz
38. Match the column I and II, and choose the correct combination from the options given  
 Column-I                      Column-II  
 A. Chlorophyll a              1. Yellow  
 B. Chlorophyll b              2. Yellow green  
 C. Carotenoids                3. Yellow to yellow orange  
 D. Xanthophylls              4. Bright or blue green  
 (1) 1-A, 3-B, 1-C, 2-D  
 (2) 3-A, 4-B, 1-C, 2-D  
 (3) 4-A, 2-B, 3-C, 1-D  
 (4) 2-A, 1-B, 4-C, 3-D
39. Polyribosomes are aggregation of  
 (1) ribosomes and rRNA  
 (2) peroxisomes  
 (3) several ribosomes held together by a string of mRNA  
 (4) tRNA
40. Select the option with correct labelling of given structure of Golgi apparatus.



- (1) A–Cisternae; B–Vesicle; C–trans face; D–cis face  
 (2) A–Cisternae; B–Vesicle; C–cis face; D–trans face  
 (3) A–Vesicle; B–Cisternae; C–cis face; D–trans face  
 (4) A–Tubules; B–Vesicle; C–trans face; D–cis face
41. In chloroplasts, chlorophyll is present in the  
 (1) outer membrane              (2) inner membrane  
 (3) thylakoids                      (4) stroma
42. One cycle of cell division in human cells takes 24 hours. Which phase occupies the maximum part of cell cycle?  
 (1) Mitotic phase                  (2) Meiotic phase  
 (3) Interphase                      (4) Cytokinesis

43. Match Column–I with Column–II and select the correct option from the codes given below.

	Column–I		Column–II
A.	V-shaped at anaphase	(i)	Acrocentric chromosome
B.	L-shaped at anaphase	(ii)	Metacentric chromosome
C.	J-shaped at anaphase	(iii)	Telocentric chromosome
D.	I-shaped at anaphase	(iv)	Sub-metacentric chromosome

- (1) A–(iv); B–(ii); C–(i); D–(iii)  
 (2) A–(ii); B–(iv); C–(i); D–(iii)  
 (3) A–(ii); B–(iv); C–(iii); D–(i)  
 (4) A–(iv); B–(iii); C–(ii); D–(i)
44. Which of the following shows the correct sequence of the given mitotic stages?  
 A–Anaphase; B–Metaphase; C–Prophase; D–Telophase  
 (1) D → C → B → A              (2) C → B → D → A  
 (3) B → A → C → D              (4) C → B → A → D
45. Meiosis consists of  
 (1) Two cell divisions without any DNA replication  
 (2) two cell divisions in which chromosome number is reduced to half  
 (3) two cell divisions with only two rounds of chromosome replication  
 (4) a single cell division with chromosome replication

## ZOOLOGY

46. Which type of barriers do saliva in the mouth and tears from the eyes belong to?  
 (1) Cytokine barriers  
 (2) Cellular barriers  
 (3) Physiological barriers  
 (4) Physical barriers
47. Grafted kidney may be rejected in a patient due to  
 (1) humoral immune response  
 (2) cell-mediated immune response  
 (3) passive immune response  
 (4) Innate immune response
48. Which one of the following statements is correct with respect to immunity?  
 (1) Preformed antibodies need to be injected to treat the bite by a viper snake.  
 (2) The antibodies against smallpox pathogen are produced by T-lymphocytes  
 (3) Antibodies are protein molecules, each of which has four light chains  
 (4) Rejection of a kidney graft is the function of B-lymphocytes

49. Primary lymphoid organs among the following are  
 (1) bone marrow (2) thymus  
 (3) Both (1) and (2) (4) lobules of thymus

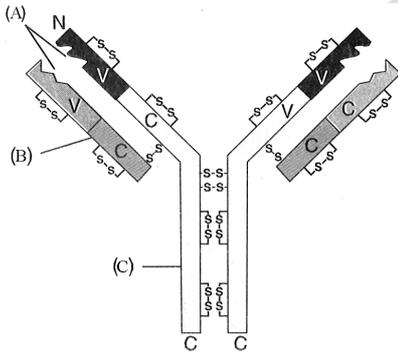
50. Match Column-I with Column-II:

	Column-I		Column-II
A.	Cardiac arrest	i.	Heart not pumping blood effectively
B.	Heart failure	ii.	Heart muscle is suddenly damaged
C.	Heart attack	iii.	Acute chest pain
D.	Angina	iv.	Heart stops beating

- (1) (A) = i; (B) = ii; (C) = iii; (D) = iv  
 (2) (A) = iv; (B) = ii; (C) = i; (D) = iii  
 (3) (A) = iv; (B) = i; (C) = ii; (D) = iii  
 (4) (A) = ii; (B) = iii; (C) = i; (D) = iv

51. Read the following statements (A-D):  
 (A) Arteries always carry blood from heart to the organs  
 (B) Valves are absent in the arteries  
 (C) Arteries always carry oxygenated blood  
 (D) Lumen of artery is wide  
 How many statements are wrong?  
 (1) Three (2) Four  
 (3) one (4) Two

52. Recognise the figure and find the correct match.



- (1) (A)–Antigen binding site; (B)–Light chain; (C)–Heavy chain  
 (2) (A)–Light chain; (B)–Heavy chain; (C)–Antigen binding site  
 (3) (A)–Heavy chain; (B)–Light chain; (C)–Antigen binding site  
 (4) (A)–Heavy chain; (B)–Antigen binding site; (C)–Light chain

53. Filtration of the blood takes place at :

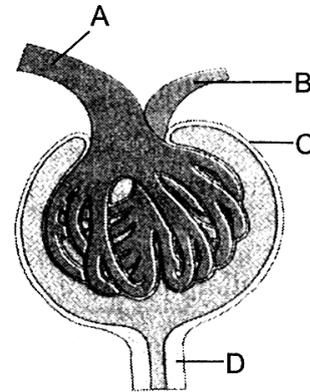
- (1) PCT  
 (2) DCT  
 (3) Collecting ducts  
 (4) Malpighian body

54. The condition of accumulation of urea in the blood is termed as:

- (1) Renal calculi (2) Glomerulonephritis  
 (3) Uremia (4) Ketonuria

55. Osmolarity of inner medulla of kidney is :  
 (1) 300-600 mosmol/L (2) 600-800 mosmol/L  
 (3) 900-1200 mosmol/L (4) 600-1200 mosmol/L

56. The given figure represents the Malpighian body. Identify the labelled parts A to D :



- (1) A-Efferent arteriole, B-Afferent arteriole, C-Bowman's capsule, D-Proximal convoluted tubule  
 (2) A-Afferent arteriole, B-Efferent arteriole, C-Renal corpuscle, D-Proximal convoluted tubule  
 (3) A-Afferent arteriole, B-Efferent arteriole, C-Bowman's capsule, D-Proximal convoluted tubule  
 (4) A-Afferent arteriole, B-Efferent arteriole, C-Bowman's capsule, D-Distal convoluted tubule

57. Following are the steps of dialysis:

- A. Blood is passed into a vein  
 B. Blood is mixed with heparin  
 C. Blood is mixed with anti-heparin  
 D. Blood is drained from convenient artery  
 E. Blood is passed through a coiled and porous cellophane tube bathing in dialysis fluid.  
 F. Removal of nitrogenous wastes from blood.  
 The correct sequence of steps is:  
 (1) A→B→C→D→E→F  
 (2) F→C→E→B→A→D  
 (3) D→B→E→F→C→A  
 (4) D→C→E→F→B→A

58. If amount of water used for elimination of  $\text{NH}_3$ , urea and uric acid is X, Y and Z respectively, then which is correct?

- (1)  $X > Y > Z$  (2)  $X > Z > Y$   
 (3)  $X < Y < Z$  (4)  $Y > Z > X$

59. Which of the following sets defines the movement of NaCl in medulla starting from loop of Henle ? [Ascending limb of loop of Henle –P, Descending limb of loop of Henle –Q, Ascending limb of vasa recta – R, Descending limb of vasa recta – S and interstitium of medulla – T]

- (1) P → Q → S → R → T  
 (2) Q → S → T → R  
 (3) P → S → R → T  
 (4) P → R → S → T

60. What are columns of Bertini (or Renal columns) ?
- (1) Extensions of medulla in cortex
  - (2) Extensions of cortex in pelvis
  - (3) Extensions of medulla in pelvis
  - (4) Extensions of cortex in medulla



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