

**SAMPLE PAPER - 100**

Time : 1 : 15 Hr.

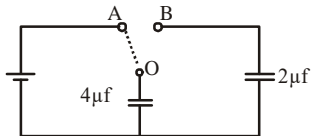
Question : 60

**PHYSICS**

01. The minimum number of  $8\mu\text{F}$  and  $250\text{ V}$  capacitors which are used to make a combination of capacitance  $16\mu\text{F}$  and voltage  $1000\text{ V}$  is  
 (1) 4 (2) 32 (3) 8 (4) 3

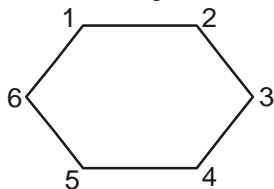
02. Two balls, each of radius  $R$ , equal mass and density are placed in contact, then the force of gravitation between them is proportional to  
 (1)  $F \propto \frac{1}{R^2}$  (2)  $F \propto R$   
 (3)  $F \propto R^4$  (4)  $F \propto \frac{1}{R}$

03. In the circuit shown below,  $O$  is connected first to  $A$ . It charges capacitor  $4\mu\text{f}$ . Now the connection of  $O$  is switched to  $B$ . The ratio of final charge to initial charge on the  $4\mu\text{f}$  capacitor is,



- (1) 1 (2)  $2/3$  (3)  $3/4$  (4)  $1/3$

04. Four point masses each of mass  $m$  are placed at points 1, 2, 3 and 6 of a regular hexagon of side  $a$ . The gravitational field at the centre of hexagon is



- (1)  $\frac{G.m}{a^2}$  (2)  $\frac{\sqrt{2}G.m}{a^2}$   
 (3)  $\frac{\sqrt{3}G.m}{a^2}$  (4) Zero

05. If acceleration due to gravity at distance  $d$  ( $d < R$ ) from the centre of earth is  $\beta$ , then its value at distance  $d$  above the surface of earth will be [where  $R$  is radius of earth]

- (1)  $\frac{\beta R^2}{(R+d)^3}$  (2)  $\frac{\beta R}{2d}$   
 (3)  $\frac{\beta R}{(R+d)^2}$  (4)  $\frac{\beta R^3}{d(R+d)^2}$

06. A particle of mass  $m$  is thrown upwards from the surface of the earth, with a velocity  $u$ . The mass and the radius of the earth are, respectively  $M$  and  $R$ .  $G$  is gravitational constant and  $g$  is acceleration due to gravity on the surface of the earth. The minimum value of  $u$  so that the particle does not return back to earth, is

- (1)  $\sqrt{2gR^2}$  (2)  $\sqrt{\frac{2GM}{R^2}}$   
 (3)  $\sqrt{\frac{2GM}{R}}$  (4)  $\sqrt{\frac{2gM}{R^2}}$

07. When a sphere is taken to bottom of sea  $1\text{ km}$  deep, it contracts by  $0.01\%$ . The bulk modulus of elasticity of the material of sphere is (take, density of water =  $1\text{ g cm}^{-3}$ )  
 (1)  $9.8 \times 10^{10}\text{ Nm}^{-2}$  (2)  $10.2 \times 10^{10}\text{ Nm}^{-2}$   
 (3)  $0.98 \times 10^{10}\text{ Nm}^{-2}$  (4)  $8.4 \times 10^{10}\text{ Nm}^{-2}$

08. A ball released from the top of a tower travels  $\frac{11}{36}$  of the height of the tower in the last second of its journey. the height of the tower is (Take  $g = 10\text{ ms}^{-2}$ )  
 (1)  $11\text{ m}$  (2)  $36\text{ m}$  (3)  $47\text{ m}$  (4)  $180\text{ m}$

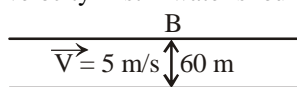
09. If unit vectors  $\hat{A}$  and  $\hat{B}$  are inclined at an angle  $\theta$ , then  $|\hat{A} - \hat{B}|$  is  
 (1)  $2 \sin \frac{\theta}{2}$  (2)  $2 \cos \frac{\theta}{2}$   
 (3)  $2 \tan \frac{\theta}{2}$  (4)  $\tan \theta$

10. A body is projected at  $60^\circ$  with ground. It covers a horizontal distance of 100 m. If the same body is projected at  $60^\circ$  with vertical with same velocity, the new range is  
 (1) 50 m (2) 100 m (3) 200 m (4) 150 m

11. To the captain of a ship A travelling with velocity  $\vec{v}_A = (3\hat{i} - 4\hat{j})$  km/h, a second ship B appears to have a velocity  $(5\hat{i} + 12\hat{j})$  km/h. What is the true velocity of the ship B?

- (1)  $2\hat{i} + 16\hat{j}$  km/h (2)  $13\hat{i} + 8\hat{j}$  km/h  
 (3)  $-2\hat{i} - 16\hat{j}$  km/h (4)  $8(\hat{i} + \hat{j})$  km/h

12. A man is crossing a river flowing with velocity of 5 m/s. He reaches a point directly across at a distance of 60 m in 5 sec. His velocity in still water should be



- (1) 12 m/s (2) 13 m/s  
 (3) 5 m/s (4) 10 m/s

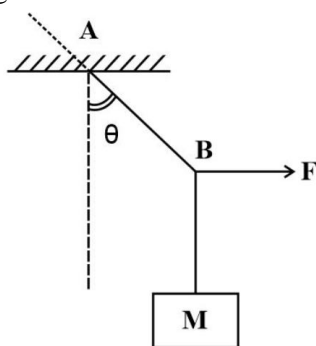
13. For a particle performing uniform circular motion, choose the incorrect statement from the following

- (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

14. The maximum height attained by a projectile is increased by 5%. Keeping the angle of projection constant, what is the percentage increase in horizontal range?

- (1) 5% (2) 10% (3) 15% (4) 20%

15. A mass M is suspended by a rope from rigid support at A as shown in the figure. Another rope is tied at the end B and it is pulled horizontally with a force F. If the rope AB makes an angle  $\theta$  with the vertical, then the tension in the string AB is



- (1)  $F \sin \theta$  (2)  $\frac{F}{\sin \theta}$  (3)  $F \cos \theta$  (4)  $\frac{F}{\cos \theta}$

16. A Mixture of  $N_2$  and  $H_2$  is caused to react in a closed container to form  $NH_3$ . The reaction ceases before either reactant has been totally consumed. At this stage, 2.0 moles each of  $N_2$ ,  $H_2$  and  $NH_3$  are present. The moles of  $N_2$  and  $H_2$  present originally were respectively,

- (1) 4 and 4 moles (2) 3 and 5 moles  
 (3) 3 and 4 moles (4) 4 and 5 moles

17. The vapour density of undecomposed  $N_2O_4$  is 46. When heated, the vapour density decreases to 24.5 due to its dissociation to  $NO_2$ . The percentage dissociation of  $N_2O_4$  at the final temperature is

- (1) 87 (2) 60 (3) 40 (4) 70

18.  $K_c$  for  $A + B \rightleftharpoons 3C$  is 20 at  $25^\circ C$ . If a 2-litre vessel contains 1, 2 and 4 moles of A, B and C respectively, the reaction at  $25^\circ C$  shall

- (1) proceed from left to right  
 (2) proceed from right to left  
 (3) be at equilibrium  
 (4) not occur

19. When  $CaCO_3$  is heated at a constant temperature in a closed container, the pressure due to  $CO_2$  produced will

- (1) change with the amount of  $CaCO_3$  taken  
 (2) change with the size of the container  
 (3) remain constant so long as temperature is constant  
 (4) remain constant even if temperature is changed

20. Equal mass of  $Fe_2O_3$  and  $FeO$  has mass of oxygen in the ratio:

- (1) 1.35 (2) 0.74  
 (3) 0.37 (4) 2.7

21. Which of the following order of energies of molecular orbitals of  $N_2$  is correct?

- (1)  $(\pi^* 2p_y) < (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$   
 (2)  $(\pi 2p_y) > (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$   
 (3)  $(\pi 2p_y) < (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$   
 (4)  $(\pi 2p_y) > (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$

22. In which of the following processes, the bond order has increased and paramagnetic character has changed to diamagnetic?

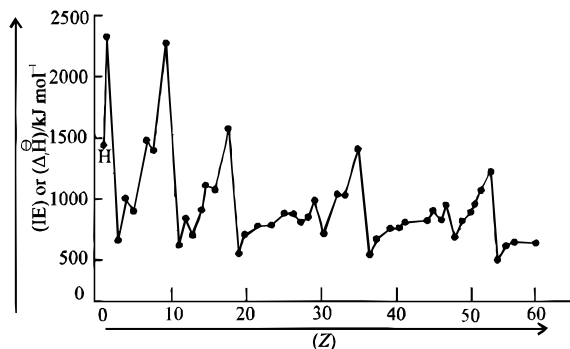
- (1)  $N_2 \rightarrow N_2^+$  (2)  $NO \rightarrow NO^+$   
 (3)  $O_2 \rightarrow O_2^{2-}$  (4)  $O_2 \rightarrow O_2^+$

23. Among the following molecules / ions,  $C_2^{2-}$ ,  $N_2^{2-}$ ,  $O_2^{2-}$ ,  $C_2$

which one is diamagnetic and has the shortest bond length?

- (1)  $C_2^{2-}$  (2)  $N_2^{2-}$  (3)  $O_2$  (4)  $O_2^{2-}$

24. The graph of  $IE_1$  or  $\Delta H_1$  versus atomic number (Z) is given below :



Which of the following statement is correct ?

- (1) Alkali metals are at the maxima and noble gases at the minima.  
 (2) Noble gases are at the maxima and alkali metals at the minima.  
 (3) Transition elements are at the maxima.  
 (4) Minima and maxima do not show any regular behaviour

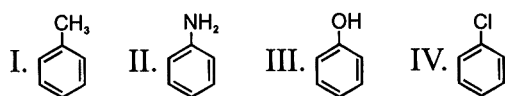
25. The ionic radii of  $O^{2-}$ ,  $F^-$ ,  $Na^+$  and  $Mg^{2+}$  are 1.35, 1.34, 0.95 and 0.66 Å respectively. The radius of the Ne atom is

- (1) 1.39 Å (2) 1.12 Å  
 (3) 0.85 Å (4) 0.50 Å

26. Correct order of basic strength of given amine in aqueous medium

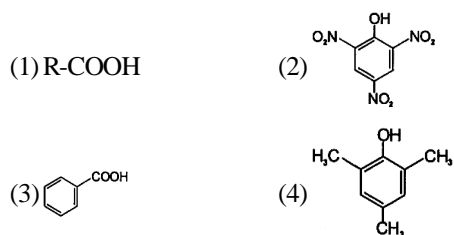
- $C_2H_5NH_2$ ,  $(C_2H_5)_2NH$ ,  $(C_2H_5)_3N$ ,  $C_6H_5NH_2$   
 (1)  $(C_2H_5)_2NH > C_2H_5NH_2 > (C_2H_5)_3N > C_6H_5NH_2$   
 (2)  $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > C_6H_5NH_2$   
 (3)  $(C_2H_5)_2NH > (C_2H_5)_3N > C_6H_5NH_2 > C_2H_5NH_2$   
 (4)  $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > C_6H_5NH_2$

27. Arrange in decreasing order of rate of reactivity.



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

28. Which molecules do not give out  $CO_2$  with  $NaHCO_3$



29. Which artificial sweetener contains chlorine?

- (1) Aspartame (2) Saccharin  
 (3) Sucralose (4) Alitame

30. Which of the following is an analgesic?

- (1) Novalgin (2) Penicillin  
 (3) Streptomycin (4) Chloromycetin

## BOTANY

31. What is the direction of movement of sugars in phloem?

- (1) Non-multidirectional (2) Upward  
 (3) Downward (4) Bi-directional

32. A column of water within xylem vessels of tall trees does not break under its weight because of

- (1) dissolved sugars in water  
 (2) tensile strength of water  
 (3) lignification of xylem vessels  
 (4) positive root pressure

33. Which of the following is a macronutrient

- (1) Mo (2) Mg  
 (3) Mn (4) Zn

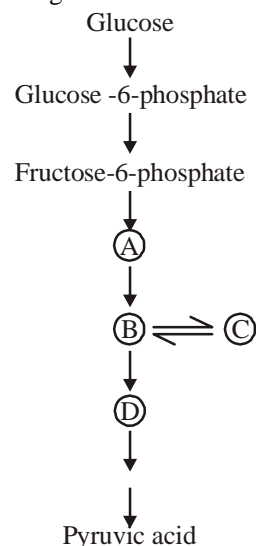
34. Anatomy of  $C_4$  plant leaf shows

- (1) Presence of peroxisomes  
 (2) Presence of bundle sheath cells  
 (3) Absence of mitochondria  
 (4) Absence of bundle sheath cells

35. Number of oxygen molecules required during glycolysis of one glucose molecule is

- (1) 6 (2) 8  
 (3) 2 (4) Zero

36. Recognise the figure and find out the correct matching.

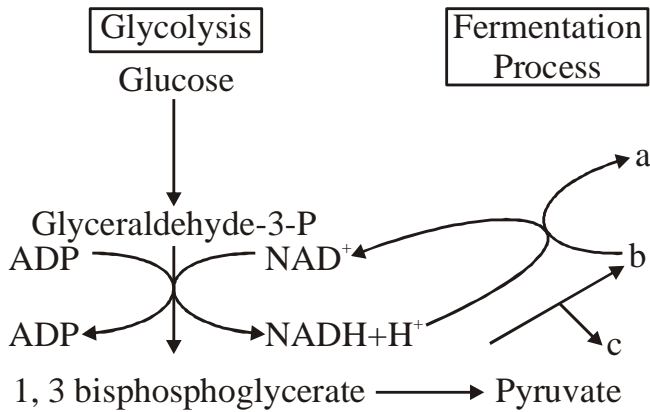


- (1) A-glyceraldehyde 3-phosphate, B- fructose 1,6-bisphosphate, C-1,3-bisphosphoglyceric acid, D-dihydroxy acetone phosphate

- (2) B-glyceraldehyde 3-phosphate, C-fructose 1,6-bisphosphate, D-1,3-bisphosphoglyceric acid, A-dihydroxy acetone phosphate

- (3) B-glyceraldehyde 3-phosphate, D-fructose 1,6 bisphosphate, A-1,3-bisphosphoglyceric acid, C-dihydroxy acetone phosphate  
 (4) B-glyceraldehyde 3-phosphate, A-fructose 1,6-bisphosphate, D-1,3-bisphosphoglyceric acid, C-dihydroxy acetone phosphate

37. Recognise the figure and find out the correct labelling.



- (1) a-ethanol, b-CO<sub>2</sub>, c-acetaldehyde  
 (2) a-CO<sub>2</sub>, b-acetaldehyde, c-ethanol  
 (3) a-CO<sub>2</sub>, b-ethanol, c-acetaldehyde  
 (4) a-ethanol, b-acetaldehyde, c-CO<sub>2</sub>
38. Single turn of citric acid cycle yields  
 (1) 2 FADH<sub>2</sub>, 2NADH<sub>2</sub>, 2 GTP  
 (2) 1 FADH<sub>2</sub>, 2NADH<sub>2</sub>, 1 GTP  
 (3) 1 FADH<sub>2</sub>, 3 NADH<sub>2</sub>, 1 GTP  
 (4) 1 FADH<sub>2</sub>, 4 NADH<sub>2</sub>, 1 GTP
39. Natural parthenogenesis occurs in:  
 (1) Frogs to form females  
 (2) Honeybee to produce drones  
 (3) Cockroach  
 (4) Vegetarian eggs
40. The pollen grain is:  
 (1) An immature male gametophyte  
 (2) A mature male gametophyte  
 (3) Partially developed male gametophyte  
 (4) None of these
41. How many pollen grains are formed from 20 microspore mother cells by meiosis ?  
 (1) 80 (2) 40  
 (3) 20 (4) 10
42. Dr. G.N. Ramachandran proposed the:  
 (1) Triple helical structure of collagen  
 (2) Double helical structure of D.N.A  
 (3) α- helical structure of protein  
 (4) All the above

43. The surface structure that helps in providing the motility is:  
 (1) Pili (2) Fimbriae  
 (3) Flagella (4) All the above
44. The Secondary wall in a mature plant cell is formed towards:  
 (1) Inner side of the cell  
 (2) Outer side of the cell  
 (3) In-between the two cells  
 (4) None of the above
45. Flagella of bacteria are made up of  
 (1) Proteins (2) Carbohydrates  
 (3) Lipids (4) Nucleic acid

## ZOOLOGY

46. Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?  
 (1) Mammalia — Give birth to young ones  
 (2) Reptilia — Possess 3-chambered heart with one incompletely divided ventricle  
 (3) Chordata Possess a mouth provided with an upper and lower jaw  
 (4) Chondrichthyes Possess cartilaginous endoskeleton
47. All the following are characterized by hypothyroidism except:  
 (1) weight gain  
 (2) heat intolerance  
 (3) decreased metabolic rate  
 (4) bradycardia
48. Pancreatic duct of a healthy dog is blocked. Which one of the functions of pancreas will not be affected?  
 (1) Maintenance of normal blood sugar level  
 (2) Carbohydrate digestion  
 (3) Protein digestion  
 (4) Neutralisation of chyme
49. Blood pressure is controlled by:  
 (1) hormone secreted by anterior pituitary  
 (2) hormone secreted by mid-pituitary  
 (3) hormone secreted by posterior pituitary  
 (4) adrenaline
50. A family has five girls and no sons. Probability of son in the sixth child will be:  
 (1) 20% (2) 50%  
 (3) 75% (4) 100%
51. A woman with no history of colour blindness marries a colour blind man. What are the risks for this couple having a son or daughter who is colour blind?  
 (1) 0% (2) 25%  
 (3) 50% (4) 100%

52. A child's blood group is 'O'. The parents blood group can not be:  
 (1) A and A (2) A and B  
 (3) B and O (4) AB and B
53. Extrachromosomal, self-replicating double stranded circular DNA in bacterial cell is called  
 (1) Plasmid (2) Cosmid  
 (3) Phagemid (4) Bacteriophage
54. First artificial DNA molecule was constructed by Cohen and 1 in 2. They used 3 enzyme to isolate the antibiotic resistance gene. They synthesized recombinant DNA by linking the antibiotic resistance gene with 4 DNA of 5 bacteria. Recombinant DNA with newly introduced antibiotic resistance gene was then transferred into another bacteria 6.  
 (1) 1-Tatum, 3-Restriction, 5-E.coli  
 (2) 4-Plasmid, 6-Salmonella  
 (3) 2-1972, 3-Restriction, 6-E.coli  
 (4) 3-DNA ligase, 4-Plasmid, 5-E.coli
55. Which enzyme joins sticky ends of DNA?  
 (1) Restriction exonuclease  
 (2) EcoRI  
 (3) DNA ligase  
 (4) Oxidoreductase
56. Which of the following help to visualize DNA fragment?  
 (1) Agarose  
 (2) Ethidium bromide  
 (3) Exposure to UV radiation  
 (4) Both (2) & (3)
57. In pBR322, tetracycline resistance gene ( $ter^r$ ) has recognition site for which of the following restriction endonuclease?  
 (1) Hind III (2) Bam HI  
 (3) EcoRI (4) Pst I
58. Palindromic DNA sequence for EcoRI is  
 (1) 5'-GATTA-3'  
 (2) 5'-GAATTA-3'  
 (3) 3'-CTTAAG-5'  
 (4) 3'-ATTGAG-5'
59. All of the following are features required to facilitate cloning into a vector except which of the following?  
 (1) Nutrient medium  
 (2) Cloning sites  
 (3) Selectable marker  
 (4) Origin of replication
60. ....A.... can transform normal animal cells into cancerous cells while ....B.... can transform the normal plant cells into tumor.  
 (1) A-pBR322; B-Retroviruses  
 (2) A-Retroviruses; B-Ti plasmids  
 (3) A-Restriction enzymes; B-Ti plasmids  
 (4) A-Restriction enzymes; B-pBR322