

**SECTION – 1 (PHYSICS)**

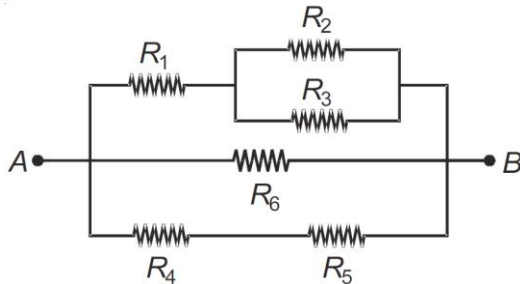
- A convex mirror is used to form an image of a real object. Then mark the wrong statement

(1) The image lies between the pole and focus    (2) The image is diminished in size  
 (3) The image is erect    (4) The image is real
- A concave mirror of focal length  $f$  produces an image  $n$  times the size of the object. If the image is real then the distance of the object from the mirror is

(1)  $(n-1)f$     (2)  $\left\{\frac{(n-1)}{n}\right\}f$     (3)  $\left\{\frac{(n+1)}{n}\right\}f$     (4)  $(n+1)f$
- A convex mirror has a focal length  $f$ . A real object is placed at a distance  $f$  in front of it, from the pole. It produces an image at

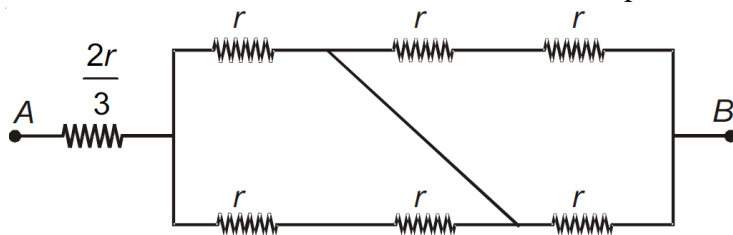
(1) Infinity    (2)  $f$     (3)  $f/2$     (4)  $2f$
- An object placed in front of a concave mirror of focal length  $0.15$  m produces a virtual image, which is twice the size of the object. The position of the object with respect to the mirror is

(1)  $-5.5$  cm    (2)  $-6.5$  cm    (3)  $-7.5$  cm    (4)  $-8.5$  cm
- Consider the combination of resistors as shown in figure and pick out the correct statement



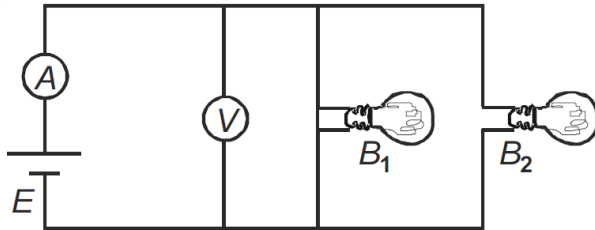
- (1)  $R_1$  &  $R_4$  are connected in parallel    (2)  $R_1$  &  $R_2$  are connected in series  
 (3)  $R_2$  &  $R_3$  are connected in parallel    (4)  $R_6$  &  $R_4$  are connected in parallel
- Select the correct statement

(1) Electric current is a vector quantity  
 (2) Resistivity of a conductor decreases with increase in temperature  
 (3) Resistance is the opposition to the flow of current  
 (4) Current density is a scalar quantity
- The effective resistance of the network between points A & B is



- (1)  $r$     (2)  $2r$     (3)  $\frac{4r}{3}$     (4)  $\frac{7r}{3}$

8. Two identical bulbs are connected in parallel across an ideal source of emf  $E$ . The ammeter  $A$  and voltmeter  $V$  are ideal. If bulb  $B_2$  gets fused, then



- (1) Reading of  $A$  will increase but that of  $V$  will remain same  
 (2) Reading of  $A$  will decrease but that of  $V$  will increase  
 (3) Reading of  $A$  will decrease but that of  $V$  will remain same  
 (4) Reading of  $A$  will increase and reading of  $V$  will also increase
9. A certain piece of copper is to be shaped into a conductor of minimum resistance. Its length and diameter should respectively be
- (1)  $L, D$                       (2)  $2L, \frac{D}{2}$                       (3)  $\frac{L}{2}, 2D$                       (4)  $L, \frac{D}{2}$
10. A wire of resistance  $x$  ohm is drawn out, so that its length is increased to twice its original length, and its new resistance becomes  $20 \Omega$ , then  $x$  will be
- (1)  $5\Omega$                       (2)  $10\Omega$                       (3)  $15\Omega$                       (4)  $20\Omega$
11. A wire has resistance  $12 \text{ ohm}$ . It is bent in the form of a circle. The effective resistance between the two points on any diameter of the circle is
- (1)  $12\Omega$                       (2)  $24\Omega$                       (3)  $3\Omega$                       (4)  $6\Omega$
12. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It
- (1) Will stay in north-south direction only  
 (2) Will stay in east-west direction only  
 (3) Will become rigid showing no movement  
 (4) Will stay in any position
13. Due to earth's magnetic field, the charged cosmic rays particles
- (1) Can never reach the pole  
 (2) Can never reach the equator  
 (3) Require greater kinetic energy to reach the equator than pole  
 (4) Require less kinetic energy to reach the equator than pole
14. There are four light-weight-rod samples,  $A, B, C, D$  separately suspended by threads. A bar magnet is slowly brought near each sample and the following observations are noted
- (i)  $A$  is feebly repelled  
 (ii)  $B$  is feebly attracted  
 (iii)  $C$  is strongly attracted  
 (iv)  $D$  remains unaffected
- Which one of the following is true?
- (1)  $A$  is of a non-magnetic material                      (2)  $B$  is of a paramagnetic material  
 (3)  $C$  is of a diamagnetic material                      (4)  $D$  is of a ferromagnetic material

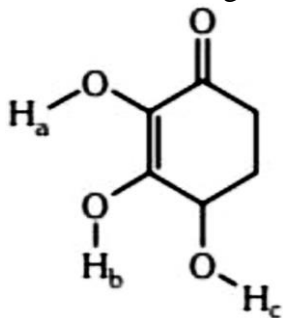
15. For protecting a sensitive equipment from the external magnetic field, it should be  
(1) Surrounded with fine copper sheet  
(2) Placed inside an iron can  
(3) Wrapped with insulation around it when passing current through it  
(4) Placed inside an aluminium can
16. If a diamagnetic substance is brought near north or south pole of a bar magnet, it is  
(1) Repelled by north pole and attracted by the south pole  
(2) Repelled by the poles  
(3) Attracted by the poles  
(4) Attracted by the north pole and repelled by the south pole
17. A car moves with speed 60 km/h for 1 hour in east direction and with same speed for 30 min in south direction. The displacement of car from initial position is  
(1) 60 km                      (2)  $30\sqrt{3}$ km                      (3)  $30\sqrt{5}$ km                      (4)  $60\sqrt{2}$ km
18. A boat covers certain distance between two spots in a river taking  $t_1$  hrs going downstream and  $t_2$  hrs going upstream. What time will be taken by boat to cover same distance in still water?  
(1)  $\frac{t_1+t_2}{2}$                       (2)  $2(t_1-t_1)$                       (3)  $\frac{2t_1t_2}{t_1+t_2}$                       (4)  $\sqrt{t_1t_2}$
19. A body is projected vertically upward direction from the surface of earth. If upward direction is taken as positive, then acceleration of body during its upward and downward journey are respectively  
(1) Positive, negative                      (2) Negative, negative  
(3) Positive, positive                      (4) Negative, positive
20. A car travelling at a speed of 30 km/h is brought to rest in a distance of 8 m by applying brakes. If the same car is moving at a speed of 60 km/h then it can be brought to rest with same brakes in  
(1) 64 m                      (2) 32 m                      (3) 16 m                      (4) 4 m
21. From Newton's second law of motion, it can be inferred that  
(1) No force is required to move a body uniformly along straight line  
(2) Accelerated motion is always due to an external force  
(3) Inertial mass of a body is equal to force required per unit acceleration in the body  
(4) All of these
22. If a force of constant magnitude acts in direction perpendicular to the motion of a particle, then its  
(1) Speed is uniform                      (2) Momentum is uniform  
(3) Velocity is uniform                      (4) All of these
23. A body of mass 2 kg is sliding with a constant velocity of 4 m/s on a frictionless horizontal table. The force required to keep the body moving with the same velocity is  
(1) 8 N                      (2) 0 N                      (3)  $2 \times 10^4$  N                      (4)  $\frac{1}{2}$  N

24. A block of mass  $m$  is released on a smooth inclined plane of inclination  $\theta$  with the horizontal. The force exerted by the plane on the block has a magnitude
- (1)  $mg$                       (2)  $\frac{mg}{\cos \theta}$                       (3)  $mg \tan \theta$                       (4)  $mg \cos \theta$
25. A weight  $Mg$  is suspended from the middle of a rope whose ends are at the same level. The rope is no longer horizontal. The minimum tension required to completely straighten the rope is
- (1)  $\frac{Mg}{2}$                       (2)  $Mg \cos \theta$                       (3)  $2Mg \cos \theta$                       (4) Infinitely large

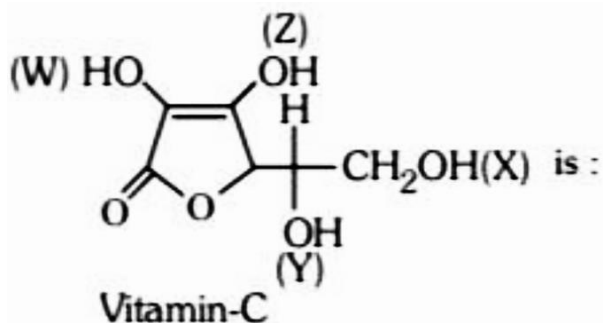
## SECTION – 2 (CHEMISTRY)

26. Mole fraction of A in  $H_2O$  is 0.2. The molality of A in  $H_2O$  is :
- (1) 13.9                      (2) 15.5                      (3) 14.5                      (4) 16.8
27. What is the molarity of  $H_2SO_4$  solution that has a density of 1.84 g/cc and contains 98% by mass of  $H_2SO_4$  ? (Given atomic mass of S = 32)
- (1) 4.18 M                      (2) 8.14 M                      (3) 18.4 M                      (4) 18 M
28. The molality of a sulphuric acid solution is 0.2. Calculate the total weight of the solution having 1000gm of solvent.
- (1) 1000g                      (2) 1098.6g                      (3) 980.4g                      (4) 1019.6g
29. In a certain electronic transition in the hydrogen atom from an initial state I to a final state f, the difference in the orbit radius ( $r_f - r_i$ ) is seven times the Bohr radius. Identify the transition.
- (1)  $4 \rightarrow 1$                       (2)  $4 \rightarrow 2$                       (3)  $4 \rightarrow 3$                       (4)  $3 \rightarrow 1$
30. The velocity of electron in the ground state of H atom is  $2.185 \times 10^8$  cm/sec. The velocity of electron in the second orbit of  $Li^{2+}$  ion in cm/sec would be
- (1)  $3.276 \times 10^8$                       (2)  $2.185 \times 10^8$                       (3)  $4.91 \times 10^8$                       (4)  $1.638 \times 10^8$
31. In which of the following the energy change corresponds to first ionization potential :-
- (1)  $X_{(g)} \rightarrow X^+_{(g)} + e$                       (2)  $2X_{(g)} \rightarrow 2X^+_{(g)} + 2e$   
(3)  $X_{(s)} \rightarrow X^+_{(g)} + e$                       (4)  $X_{(aq)} \rightarrow X^+_{(aq)} + e$
32. In the ions  $P^{3-}$ ,  $S^{2-}$  and  $Cl^-$  the increasing order of size is :-
- (1)  $Cl^-, S^{2-}, P^{3-}$                       (2)  $P^{3-}, S^{2-}, Cl^-$                       (3)  $S^{2-}, Cl^-, P^{3-}$                       (4)  $S^{2-}, P^{3-}, Cl^-$
33. The bond order of CO molecule on the basis of molecular orbital theory is
- (1) Zero                      (2) 2                      (3) 3                      (4) 1
34. Which of the following pairs of species have unpaired electrons in antibonding molecular orbitals:
- (1)  $C_2, O_2$                       (2)  $O_2, He_2^+$                       (3)  $He_2^+, C_2$                       (4)  $N_2, O_2^-$
35. The correct set of carbonate ores is :-
- (a) Magnesite                      (b) Siderite                      (c) Zincite                      (d) Argentite  
(1) a, b                      (2) a, d                      (3) c, d                      (4) b, c

36. Calcination is the process of heating the ore:-  
 (1) in inert gas (2) in the presence of air  
 (3) in the absence air (4) in the presence of CaO and MgO
37. Matte :-  
 (1)  $\text{Cu}_2\text{S} + \text{FeS}$  (2)  $\text{Cu}_2\text{O} + \text{FeS}$  (3)  $\text{Cu}_2\text{O} + \text{Cu}_2\text{S}$  (4)  $\text{FeS} + \text{SiO}_2$
38. Use resonance arguments to rank the following in order of increasing acidic strength.



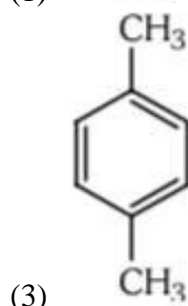
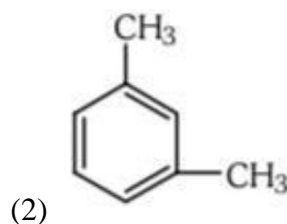
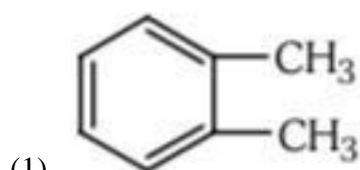
- (1)  $\text{H}_c < \text{H}_a < \text{H}_b$  (2)  $\text{H}_b < \text{H}_a < \text{H}_c$  (3)  $\text{H}_b < \text{H}_c < \text{H}_a$  (4)  $\text{H}_c < \text{H}_b < \text{H}_a$
39. The most acidic 'H'



- (1) X (2) Y (3) Z (4) W
40. Which of the following shows the correct order of decreasing basicity in aqueous medium ?  
 (1)  $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3$   
 (2)  $(\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > \text{NH}_3$   
 (3)  $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$   
 (4)  $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3 > (\text{CH}_3)_3\text{N}$
41. The molar conductance of  $\text{AgNO}_3$ ,  $\text{AgCl}$  and  $\text{NaCl}$  at infinite dilution are 116.5, 121.6 and 110.3  $\text{cm}^3 \text{mol}^{-1}$  respectively. The molar conductance of  $\text{NaNO}_3$  is :  
 (1)  $111.4 \text{ S cm}^2 \text{mol}^{-1}$  (2)  $105.2 \text{ S cm}^2 \text{mol}^{-1}$   
 (3)  $130.6 \text{ S cm}^2 \text{mol}^{-1}$  (4)  $150.2 \text{ S cm}^2 \text{mol}^{-1}$
42. The conductivity of a saturated solution of  $\text{BaSO}_4$  is  $3.06 \times 10^{-6} \text{ ohm}^{-1} \text{ cm}^{-1}$  and its molar conductance is  $1.53 \text{ ohm}^{-1} \text{ cm}^2 \text{mol}^{-1}$ . The  $K_{\text{sp}}$  of  $\text{BaSO}_4$  will be  
 (1)  $4 \times 10^{-12}$  (2)  $2.5 \times 10^{-9}$  (3)  $2.5 \times 10^{-13}$  (4)  $4 \times 10^{-6}$

43. Kohlrausch's law states that at :-  
 (1) Infinite dilution, each ion makes definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.  
 (2) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.  
 (3) Finite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.  
 (4) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of the electrolyte

44. Ring nitration of dimethyl benzene results in the formation of only one nitro dimethyl benzene. The dimethyl benzene is:



(4) None of these

45. An aromatic compound of molecular formula  $C_6H_4Br$  was nitrated then only product of formula  $C_6H_3Br_2NO_2$  were obtained. The original compound is:

- (1) o-dibromobenzene (2) m-dibromobenzene  
 (3) p-dibromobenzene (4) Both 1 and 3

46. Which of the following is/are produced when a mixture of benzene vapour and oxygen is passed over  $V_2O_5$  catalyst at 775 K?

- (1) Oxalic acid (2) Glyoxal (3) Fumaric acid (4) Maleic anhydride

47. Methyl group attached to benzene can be oxidised to carboxylic group by reacting with:

- (1)  $Fe_2O_3$  (2)  $AgNO_3$  (3)  $KMnO_4$  (4)  $CrO_3$

48. For  $NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$ , if  $K_p = 64 atm^2$ , equilibrium pressure of mixture is :

- (1) 8 atm (2) 4 atm (3) 64 atm (4) 16 atm

49. Which of the following expressions is not true ?

- (1)  $[H^+] = [OH^-] = \sqrt{K_w}$  for a neutral solution at all temperatures  
 (2)  $[H^+] > \sqrt{K_w}$  &  $[OH^-] < \sqrt{K_w}$  for an acidic solution  
 (3)  $[H^+] < \sqrt{K_w}$  &  $[OH^-] > \sqrt{K_w}$  for an alkaline solution  
 (4)  $[H^+] = [OH^-] = 10^{-7} M$  for a neutral solution at all temperatures.

50. pOH of H<sub>2</sub>O is 7.0 at 298 K. If water is heated at 350 K, which of the following should be true?  
(1) pOH will decrease  
(2) pOH will increase  
(3) pOH will remain 7.0  
(4) concentration of H<sup>+</sup> ions will increase but that of OH<sup>-</sup> will decrease

**SECTION – 3 (BIOLOGY)**

51. \_\_\_\_\_ is regarded as a unit of nervous system.  
(1) Axon (2) Dendrite (3) Myelin sheath (4) Neuron
52. Interferons are synthesized in response to \_\_\_\_\_.  
(1) bacteria (2) fungi (3) protozoans (4) viruses
53. \_\_\_\_\_ is not a vestigial organ in man.  
(1) Coccyx (2) Nail  
(3) Third molar (4) Segmental muscles of abdomen
54. \_\_\_\_\_ is the best material for the study of mitosis in the laboratory.  
(1) Root tip (2) Leaf tip (3) Anther (4) Ovary
55. The middle piece of sperm contains \_\_\_\_\_.  
(1) nucleus (2) centriole (3) mitochondria (4) ribosome
56. If a colour blind woman marries a normal visioned man, their sons will be \_\_\_\_\_.  
(1) all colourblind  
(2) all normal visioned  
(3) one – half colourblind and one-half normal  
(4) three – four this colourblind and one-fourth normal
57. Common cold is not cured by antibiotics as it is \_\_\_\_\_.  
(1) caused by a virus (2) caused by a fungus  
(3) not an infectious disease (4) caused by a bacterium
58. Which one of the following does not act as a neurotransmitter?  
(1) Cortisone (2) Epinephrine (3) Norepinephrine (4) Acetylcholine
59. \_\_\_\_\_ is often called “the graveyard of RBCs”.  
(1) Kidney (2) Liver (3) Spleen (4) Gall bladder
60. The ovule of an angiosperm is technically equivalent to \_\_\_\_\_.  
(1) megaspore (2) megaspore mother cell  
(3) megasporangium (4) megasporophyll
61. The similarities in organisms with different genotypes indicate \_\_\_\_\_ evolution  
(1) convergent (2) divergent (3) micro (4) macro
62. The tablets to prevent contraception contain \_\_\_\_\_.  
(1) FSH (2) LH (3) both (1) and (2) (4) progesterone

63. Immunoglobulin \_\_\_\_\_ constitutes the largest percentage in human milk.  
(1) G (2) A (3) M (4) D
64. A person with blood group AB is considered as universal recipient because he/she has \_\_\_\_\_.  
(1) no antigen on RBC and no antibody in the plasma  
(2) both A and B antibodies in the plasma  
(3) both A and B antigens in the plasma but no antibodies  
(4) both A and B antigens on RBC but no antibodies in the plasma
65. Which of the following absorb light energy for photosynthesis ?  
(1) Oxygen (2) RuBisCO enzyme  
(3) Water (4) Chlorophyll
66. \_\_\_\_\_ is responsible for fruit ripening.  
(1) Auxin (2) Cytokinin (3) ABA (4) Ethylene
67. The bacterium *Salmonella* is related with \_\_\_\_\_.  
(1) TB (2) AIDS (3) Typhoid (4) Malaria
68. Industrial melauism is an example of \_\_\_\_\_.  
(1) drug resistance  
(2) defensive adaptation of skin against UV radiations  
(3) darkening of skin due to smoke from industries  
(4) protective resemblance with the surroundings
69. How many pairs of contrasting characters in *Pisum sativum* were studied by Mendel in his experiments?  
(1) 2 (2) 4 (3) 7 (4) 14
70. During cell growth, DNA synthesis takes place in the \_\_\_\_\_ phase.  
(1) M (2) S (3) G<sub>1</sub> (4) G<sub>2</sub>
71. \_\_\_\_\_ is the shared terminal duct of the reproductive system and urinary system in the human male.  
(1) Ureter (2) Vas deferens (3) Urethra (4) Vas efferentia
72. \_\_\_\_\_ is a temporary endocrine gland in the human body.  
(1) Corpus allatum (2) Corpus cardiacum  
(3) Corpus luteum (4) Pineal gland
73. In soil, the water available for plants is \_\_\_\_\_ water.  
(1) hygroscopic (2) capillary (3) chemically bound (4) gravitational
74. The aerobic respiratory pathway is appropriately termed \_\_\_\_\_.  
(1) anabolic (2) amphibolic (3) catabolic (4) parabolic
75. Uricotelic mode of passing out nitrogenous wastes is found in \_\_\_\_\_.  
(1) amphibians and reptiles (2) insects and amphibians  
(3) reptiles and birds (4) birds and annelids