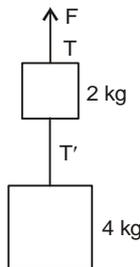


SAMPLE PAPER - 4

PHYSICS

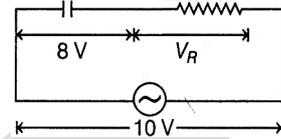
01. Two blocks are connected by a string as shown in the diagram. The upper block is hung by another string. A force F applied on the upper string produces an acceleration of 2 m/s^2 in the upward direction in both the blocks. If T and T' be the tensions in the two parts of the string, then



- (1) $T = 70.8 \text{ N}$ and $T' = 47.2 \text{ N}$
 (2) $T = 58.8 \text{ N}$ and $T' = 47.2 \text{ N}$
 (3) $T = 70.8 \text{ N}$ and $T' = 58.8 \text{ N}$
 (4) $T = 70.8 \text{ N}$ and $T' = 0$
02. Radiations of intensity 0.5 W/m^2 are striking normally a perfect absorbing metal plate. The pressure on the plate is
- (1) $0.166 \times 10^{-8} \text{ N/m}^2$
 (2) $0.332 \times 10^{-8} \text{ N/m}^2$
 (3) $0.111 \times 10^{-8} \text{ N/m}^2$
 (4) $0.083 \times 10^{-8} \text{ N/m}^2$
03. The input resistance of a silicon transistor is 100Ω . Base current is changed by $40 \mu\text{A}$ which results in a change in collector current by 2 mA . This transistor is used as a common-emitter amplifier with a load resistance of $4 \text{ k}\Omega$. The voltage gain of the amplifier is
- (1) 2000 (2) 3000 (3) 4000 (4) 1000
04. A particle executing a simple harmonic motion has a period of 6 s . The time taken by the particle to move from the mean position to half the amplitude, starting from the mean position is

- (1) $\frac{3}{2} \text{ s}$ (2) $\frac{1}{2} \text{ s}$
 (3) $\frac{3}{4} \text{ s}$ (4) $\frac{1}{4} \text{ s}$

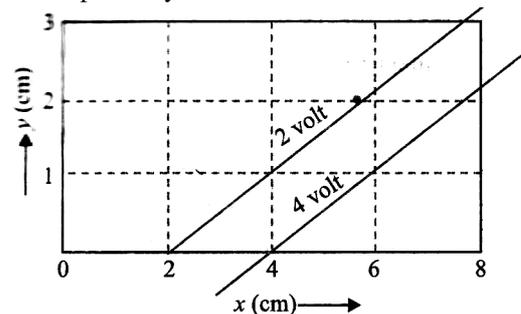
05. In a series R-C circuit shown in figure, the applied voltage is 10 V and the voltage across capacitor is found to be 8 V . Then, the voltage across R and the phase difference between current and the applied voltage will respectively be



- (1) $6 \text{ V}, \tan^{-1} \left(\frac{4}{3} \right)$ (2) $3 \text{ V}, \tan^{-1} \left(\frac{3}{4} \right)$
 (3) $6 \text{ V}, \tan^{-1} \left(\frac{5}{3} \right)$ (4) None of these

06. A gamma ray photon creates an electron-positron pair. If the rest mass energy of an electron is 0.5 MeV and the total K.E. of the electron-positron pair is 0.78 MeV , then the energy of the gamma ray photon must be
- (1) 0.78 MeV (2) 1.78 MeV
 (3) 1.28 MeV (4) 0.28 MeV

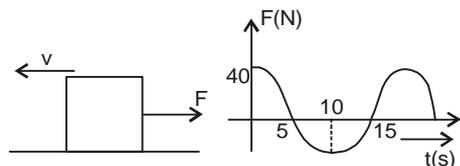
07. Figure shows two equipotential surfaces in XY plane for an electric field. Values of x component of electric field, E_x and y component of electric field, E_y at equipotential lines are respectively



- (1) $-100 \text{ V/m}, 200 \text{ V/m}$ (2) $100 \text{ V/m}, -200 \text{ V/m}$
 (3) $-200 \text{ V/m}, 100 \text{ V/m}$ (4) $200 \text{ V/m}, -100 \text{ V/m}$

08. A uniform solid spherical ball is rolling down a smooth inclined plane from a height h . The velocity attained by the ball when it reaches the bottom of the inclined plane is v . If the ball is now thrown vertically upwards with the same velocity v , the maximum height to which the ball will rise is
- (1) $5h/8$ (2) $3h/5$
 (3) $5h/7$ (4) $7h/9$

09. A 15 kg block is initially moving along a smooth horizontal surface with a speed of $v = 4$ m/s to the left. It is acted by a force F , which varies in the manner shown. Determine the velocity of the block at $t = 15$ seconds.

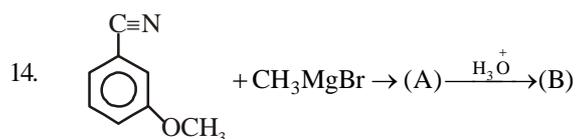


Given that, $F = 40 \cos \left(\frac{\pi}{10} \right) t$.

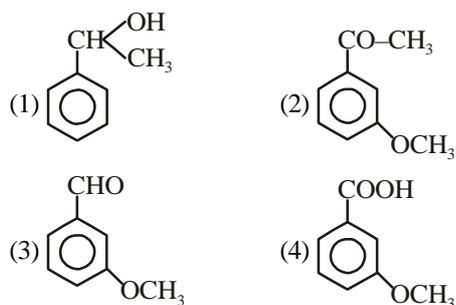
- (1) 12.5 m/s (2) 8.5 m/s
 (3) 20 m/s (4) 9.5 m/s
10. Equal volumes of water and alcohol when put in similar calorimeters take 100 sec and 74 sec respectively to cool from 50°C to 40°C . The thermal capacity of each calorimeter is numerically equal to the volume of either liquid. The specific gravity of alcohol is 0.8. If the specific heat capacity of water is 1 cal/gm, the specific heat capacity of alcohol will be
- (1) 0.6 cal/gm- $^\circ\text{C}$ (2) 0.8 cal/gm- $^\circ\text{C}$
 (3) 1.6 cal/gm- $^\circ\text{C}$ (4) 1.8 cal/gm- $^\circ\text{C}$

CHEMISTRY

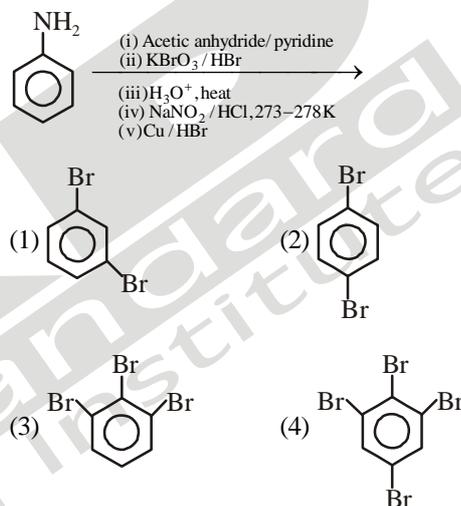
11. E° for $\text{Cl}_2(\text{g}) + 2\text{e}^- \longrightarrow 2\text{Cl}^-(\text{aq})$ is 1.36 V;
 E° for $\text{Cl}^-(\text{g}) \longrightarrow 1/2\text{Cl}_2(\text{g}) + \text{e}^-$ is;
- (1) 1.36 V (2) -1.36 V
 (3) -0.68 V (4) 0.68 V
12. From which of the following reaction anhydrous MgCl_2 can be prepared.
- (1) $\text{MgCl}_2 \cdot 6\text{H}_2\text{O} + \text{current of dry HCl}$
 (2) $\text{Mg} + \text{dil HCl on heating}$
 (3) $\text{MgCl}_2 \cdot 6\text{H}_2\text{O on heating}$
 (4) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O on heating}$
13. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4 . In the mixture, nitric acid acts as a/an:
- (1) base
 (2) acid
 (3) catalyst
 (4) reducing agent



The product (B) in the above reaction is:

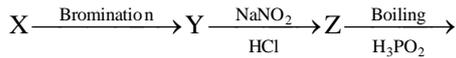


15. Select incorrect statement :-
- (1) O_3 and O_2^{2-} both are diamagnetic
 (2) Out of O_2 , O_2^+ , O_3 least O-O bond length is in O_2^+
 (3) Out of O_2 , O_2^+ , O_2^- , only O_2 is paramagnetic
 (4) Out of O_2 , O_2^+ , O_2^- , maximum spin magnetic moment is of O_2
16. The product(s) of the following reaction sequence is (are):



17. B_4 for the complex $[\text{Cu}(\text{NH}_3)_4]^{2+}$ is 2.1×10^{13} . The overall complex dissociation equilibrium constant.
- (1) 11.9
 (2) 0.5×10^{-13}
 (3) 4.7×10^{-14}
 (4) 5×10^{-14}
18. Four metals and their methods of refinement are given
- (i) Ni, Cu, Zr, Ga
 (ii) Electrolysis, van Arkel process, zone refining, Mond's process
- Choose the right method for each and choose the correct option.
- (1) Ni : Electrolysis, Cu : van Arkel process, Zr : Zone refining, Ga : Mond's process
 (2) Ni : Mond's process, Cu : Electrolysis, Zr : van Arkel process, Ga : Zone refining
 (3) Ni : Mond's process, Cu : van Arkel process, Zr : Zone refining, Ga : Electrolysis
 (4) Ni : Electrolysis, Cu : Zone refining, Zr : van Arkel process, Ga : Mond's process

19. In the following reaction, X is:



Tribromobenzene

- (1) benzoic acid (2) salicylic acid
(3) phenol (4) aniline

20. Which is the incorrect order of bond angle:-

- (1) $\text{BF}_3 > \text{NH}_3 > \text{H}_2\text{O}$ (2) $\text{BF}_3 < \text{BCl}_3 < \text{BI}_3$
(3) $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se}$ (4) $\text{NO}_2^- < \text{NO}_2 < \text{NO}_2^+$

BOTANY

21. How can we get egg membrane ?

- (1) Remove yolk and albumin through a small hole at one end of the egg.
(2) Place the shell in dilute HCl for few hours.
(3) Both (1) and (2)
(4) None of these

22. Which of the following are characteristics of the cells in meristematic region ?

- (1) Rich in protoplasm (2) Large nuclei
(3) Thin cell wall (4) All of these

23. Pericycle of roots produces

- (1) Mechanical support
(2) Lateral roots
(3) Vascular bundles
(4) Adventitious buds

24. ESTs (Expressed Sequence tags) are

- (1) Gene that expressed as RNA
(2) DNA polymorphism
(3) DNA profiling
(4) Amino acid sequence in polypeptide

25. Lac-Operon in Prokaryotes :

- (1) is regulated negatively
(2) is inducible operon
(3) Cannot be regulated positively
(4) Both (1) & (2) are correct
(5) Only (3) is correct
(6) Only (2) is correct
(7) Both (2) & (3) are incorrect

26. Animals that can tolerate a narrow range of salinity are

- (1) Stenohaline (2) Euryhaline
(3) Anadromous (4) Catadromous

27. Select the incorrect matching.

- (1) order Polynomial – Includes family convulvaceae and solanaceae
(2) Class Mammalia – Includes order Primate and Carnivora
(3) Family Solanaceae – Includes genus Solanum, Petunia and Datura
(4) Family Hominidae – Includes order Primata

28. Consider the following statements concerning food chains-

- (A) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation
(B) Removal of most of the carnivorous resulted in an increased population of deers
(C) The length of food chains is generally limited to 3–4 trophic levels due to energy loss
(D) The length of food chains may vary from 2 to 8 trophic levels

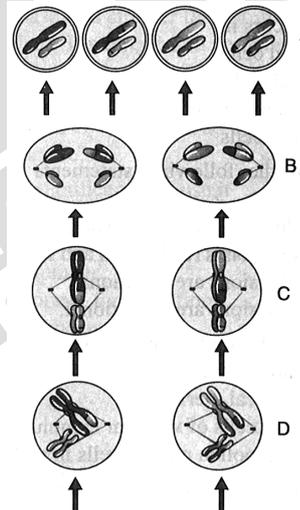
Which two of the above statements are correct?

- (1) A, D (2) A, B
(3) B, C (4) C, D

29. Escherichia coli is used as an indicator organism to determine the pollution of water with

- (1) Pollen of aquatic plants
(2) Heavy metals (3) Faecal matter
(4) Industrial effluents

30. The following diagram shows modification of the meiosis II for storage. Identify A, B, C and D given in the diagram.



- (1) A: Prophase II, B: Metaphase II, C: Anaphase II, D: Telophase II
(2) A: Anaphase II, B: Prophase II, C: Telophase II, D: Metaphase II
(3) A: Metaphase II, B: Telophase II, C: Prophase II, D: Anaphase II
(4) A: Telophase II, B: Anaphase II, C: Metaphase II, D: Prophase II

ZOOLOGY

31. Transgenic plants are the ones

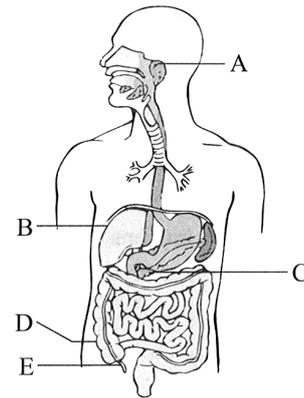
- (1) Grown in artificial medium after hybridization in the field.
(2) Produced by a somatic embryo in artificial medium.
(3) Generated by introducing foreign DNA into a cell and regenerating a plant from the cell.
(4) Produced after protoplast fusion in an artificial medium.

32. The scientific name of childbirth is
 (1) Gestation
 (2) Parturition
 (3) Implantation
 (4) Foetal development
33. The term 'breed' means
 (1) A group of animals related by descent and similar in most of the characters like general appearance, feature, size and configurations.
 (2) A group of animals which depend on each other.
 (3) A group of animals living in a same habitat.
 (4) A group of animals which can't reproduce with each other.
34. Bilateral symmetry, metameric segmentation, true coelom and open circulatory system are the features of
 (1) Annelida (2) Arthropoda
 (4) Mollusca (4) Echinodermata
35. The mouth parts of a cockroach are said to be
 (1) absorbing type
 (2) biting and absorbing type
 (3) biting and chewing type
 (4) biting and sucking type
36. Inner to the hilum of the kidney, there is a broad funnel-shaped space called
 (1) renal pelvis (2) medulla
 (3) cortex (4) adrenal gland
37. Match the following columns.

	Column-I		Column-II
A.	Wallace	1.	Essay on population
B.	Malthus	2.	Biston betularia
C.	Hardy - Weinberg's law	3.	$p^2 + q^2 + 2pq = 1$
D.	Industrial melanism	4.	Co-propo ser of natural selection

- (1) A-3; B-4; C-2; D-1 (2) A-2; B-1; C-4; D-3
 (3) A-4; B-1; C-2; D-3 (4) A-4; B-1; C-3; D-2

38. The given figure represents the human digestive system, Identify A, B, C, D and E.



- (1) A-Parotid gland; B-Liver; C-Pancreas; D-Caecum; E-Vermiform appendix
 (2) A-Parotid gland; B-Pancreas; C-Liver; D-Caecum; E-Vermiform appendix
 (3) A-Parotid gland; B-Caecum; C-Pancreas; D-Liver; E-Vermiform appendix
 (4) A-Parotid gland; B-Liver; C-Caecum; D-Pancreas; E-Vermiform appendix
39. Mark the right statement among the following:
 (1) Trypsinogen is an inactive enzyme.
 (2) Trypsinogen is secreted by intestinal mucosa.
 (3) Enterokinase is secreted by pancreas.
 (4) Bile juice contains trypsin.
40. In a nerve if sodium pump is blocked, which of the following is most likely to happen?
 (1) Na^+ inside the nerve will increase
 (2) Na^+ outside the nerve will increase
 (3) Na^+ and K^+ will increase outside the cell
 (4) K^+ inside the nerve will increase