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# SAMPLE PAPER - 17

## PHYSICS

01. The two particles of mass M each move in a circle of radius R under the action of their mutual gravitational force of attraction. The speed of each particle is

(1) $\sqrt{\frac{GM}{R}}$ (2) $\sqrt{\frac{GM}{2R}}$

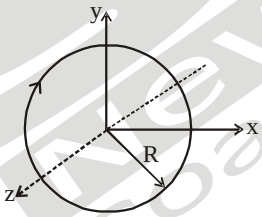
(3) $\sqrt{\frac{GM}{4R}}$ (4) $\sqrt{\frac{2GM}{R}}$

02. An insulating solid sphere of radius R has a uniform positive charge density $\rho$ . The electric field intensity at a distance r (r<R) from the centre of sphere is :

(1) $\frac{\rho.r}{3\epsilon_0}$ (2) $\frac{\rho}{\epsilon_0}$

(3) $\frac{\rho.R}{3\epsilon_0}$ (4) $\frac{\rho}{3\epsilon_0}\left(2R^2 - r^2\right)$.

03. The magnetic moment of current loop drawn in figure in x-y plane is




(1) $-\frac{\pi R^2}{2}\hat{j}$ (2) $\pi R^2 \hat{j}$

(3) $\frac{\pi R^2}{2}(\hat{i}+\hat{j})$ (4) $-\pi R^2 \hat{k}$

04. A 3 W carbon resistor is color coded with orange, black, brown respectively. The maximum current which can be passed through this resistor is:

(1) 63 mA (2) 0.4 mA
(3) 100 mA (4) 20 mA

05. Wein's constant is $2892 \times 10^{-6}$ m $K^{-1}$ and the value of $\lambda_m$ for the moon is 14.46 micron. The surface temperature of the moon is

(1) 100 K (2) 300 K
(3) 400 K (4) 200 K

06. Imagine that a reactor converts all the given mass into energy and that it operates at a power level of $10^9$ watt. The mass of the fuel consumed per hour, in the reactor, will be (velocity of light, c is $3\times10^8$ $ms^{-1}$)

(1) $6.6 \times 10^{-5}$ g (2) 0.96 g
(3) $4 \times 10^{-2}$ g (4) 0.8 g

07. The central fringe shifts to the position of fifth bright fringe, if a thin film of refractive index 1.5 is introduced in the path of light of wavelength 5000 Å. The thickness of the glass plate is

(1) 1 μm (2) 5 μm (3) 3 μm (4) 4 μm

08. If displacement x and velocity v are related as $4v^2 = 25 - x^2$ in a SHM Then time period of given SHM is (consider SI units)

(1) π (2) 2π (3) 4π (4) 6π

09. A circular flexible loop of wire of radius r carrying a current I is placed in a uniform magnetic field B. If B is doubled, tension in the loop

(1) remain unchanged (2) is double
(3) is halved (4) becomes four times

10. We wish to observe an object which is 2.5Å in size. The minimum energy photon that can be used us

(1) 5 keV (2) 8 keV
(3) 10 keV (4) 12 keV

## CHEMISTRY

11. The quantum numbers $+\frac{1}{2}$ and $-\frac{1}{2}$ for the electron spin represent

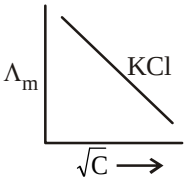
(1) rotation of the electron in clockwise and anti-clockwise direction respectively
(2) rotation of the electron in anti-clockwise and clockwise direction respectively
(3) magnetic moment of the electron pointing up and down respectively
(4) two quantum mechanical spin states which have no classical analogue

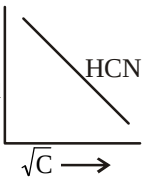
12. In the following,

$$\underset{[A]}{[Al(H_2O)_6]^{3+}} + \underset{[B]}{HCO_3^-} \rightleftharpoons \underset{[C]}{[Al(H_2O)_5OH]^{2+}} + \underset{[D]}{H_2CO_3}$$

Species behaving as Bronsted-Lowry acids are
(1) (A) and (D)
(2) (B) and (C)
(3) (B) and (D)
(4) (A) and (C)

13. Which of the following graph is/ are correct ?

(1) 


(2) 


(3) Both (1) and (2) are correct
(4) None of these

14. Identify the incorrect match.

| Name | IUPAC Official Name |
|---|---|
| (a) Unnilunium | (i) Mendelevium (Md) |
| (b) Unniltrium | (ii) Lawrencium (Lr) |
| (c) Unnilhexium | (iii)Seaborgium (Sg) |
| (d) Ununnnium | (iv) Darmstadtium (Ds) |

(1) (a), (i) (2) (b), (ii)
(3) (c), (iii) (4) (d), (iv)

15. Match the following and identify the correct option.

| | |
|---|---|
| (a) $CO(g) + H_2(g)$ | (i) Temporary hardness of water |
| (b) $Mg(HCO_3)_2 + Ca(HCO_3)_2$ | (ii) An electron deficient hydride |
| (c) $B_2H_6$ | (iii)Synthesis gas |
| (d) $H_2O_2$ | (iv) Non-planar structure |

(1) (a)-(iii) (b)-(i) (c)-(ii) (d)-(iv)
(2) (a)-(iii) (b)-(ii) (c)-(i) (d)-(iv)
(3) (a)-(iii) (b)-(iv) (c)-(ii) (d)-(i)
(4) (a)-(i) (b)-(iii) (c)-(ii) (d)-(iv)

16. Which of the following statement about primary amines is false ?
(1) Alkylamines are stronger base than aryl amines
(2) Alkylamines react with nitrous acid to produce alcohols
(3) Arylamines react with nitrous acid to produce phenols
(4) Alkylamines are stronger bases than ammonia

17. Which of the following lanthanoids shows +4 oxidation state to acquire noble gas configuration? (Atomic number : La = 57, Ce = 58, Eu = 63 and Yb = 70)
(1) Eu (2) Ce
(3) Yb (4) La

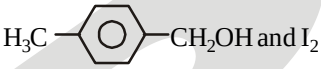
18. For a sample of perfect gas when its pressure is changed isothermally from $p_i$ to $p_f$ the entropy change is given by

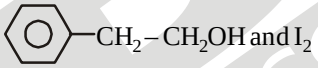
(1) $\Delta S = nR\ln\left(\frac{p_f}{p_i}\right)$ (2) $\Delta S = nR\ln\left(\frac{p_i}{p_f}\right)$

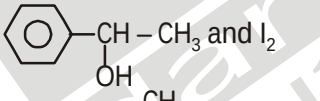
(3) $\Delta S = nRT\ln\left(\frac{p_f}{p_i}\right)$ (4) $\Delta S = RT\ln\left(\frac{p_i}{p_f}\right)$

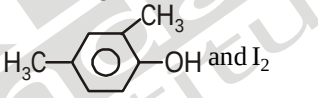
19. 0.2595 g of an organic substance in a quantitative analysis yielded 0.35 g of the barium sulphate. The percentage of sulphur in the substance is
(1) 18.52 g (2) 182.2 g
(3) 17.5 g (4) 175.2 g

20. Compound A' , $C_8H_{10}O$ , is found to react with NaOI (produced by reacting X with NaOH) and yields a yellow precipitates with characteristics smell.
A' and X are respectively :

(1) 


(2) 


(3) 


(4) 


## BOTANY

21. Which of the following genera is associated with coralloid roots?
(1) Cycas (2) Taxus
(3) Pinus (4) Sequoia

22. The type of diffusion in which substances move across the membrane along their concentration gradient in the presence of certain carriers or transport proteins is called as
(1) simple diffusion (2) facilitated diffusion
(3) osmosis (4) active transport

23. Which of the following cell organelles is associated with photorespiration?
(1) Mitochondria (2) Peroxisome
(3) Choloroplast (4) All of these

24. Identify the stop codons in given options.
(1) UAA, UAG, UGA
(2) UCA, UCC, UCA
(3) UGC, UCG, UCC
(4) UUU, UAT, UTA

25. Mitochondria and chloroplast are
I. Semi-autonomous organelles
II. Formed by division of pre-existing organelles and they contain DNA but lack protein synthesising machinery.
Which one of the following options is correct?
(1) Both I and II are correct
(2) II is true but I is false
(3) I is true but II is false
(4) Both I and II are false

26. Who gave 'Rivet Popper hypothesis'?
(1) E.P. Odum (2) Paul Ehrlich
(3) Ram Deo Misra (4) A. Tansley

27. Bread becomes porous due to release of $CO_2$ by the action of
(1) Yeast (2) Bacteria
(3) Virus (4) Protozoans

28. Match the Column–I with Column–II, and choose the correct combination from the options given below.

| | Column–I | | Column–II |
|---|---|---|---|
| a. | Natural auxin | 1. | ABA |
| b. | Synthetic auxin | 2. | IBA |
| c. | Stress hormone | 3. | NAA |
| d. | Zeatin | 4. | Cytokinin |

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

29. Standing crop is
(1) All photosynthetic living forms of an area
(2) Amount of living matter in a component of population at any time
(3) All living forms
(4) All crop plants in an area

30. Which of the following statements is/are true?
(a) Uneven thickening of cell wall is characteristic of sclerenchyma.
(b) Periblem forms cortex of the stem and the root.
(c) Tracheids are the chief water transporting elements in gymnosperms.
(d) Companion cell is devoid of nucleus at maturity.
(e) The commercial cork is obtained from Quercus suber.
(1) (a) and (d) only (2) (b) and (e) only
(3) (c) and (d) only (4) (b), (c) and (e) only

## ZOOLOGY

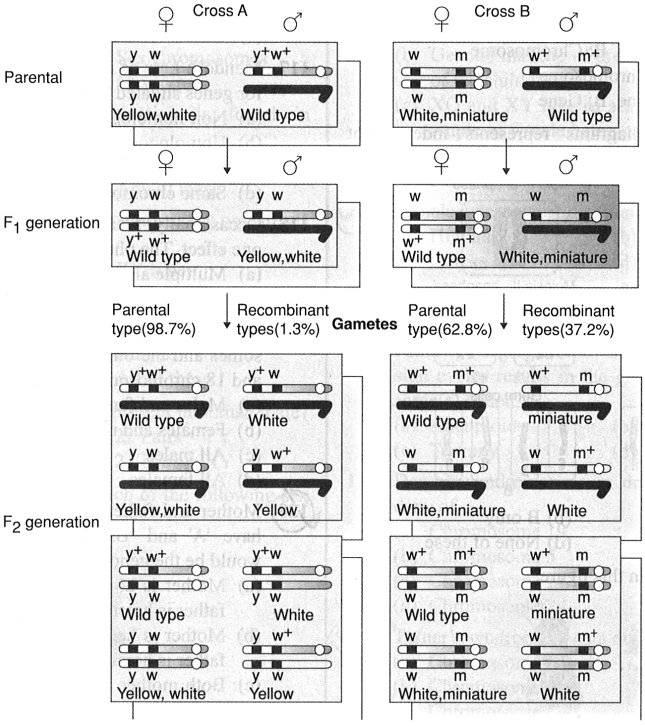
31. The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in:
(1) Fallopian tubes and Pancreatic duct
(2) Eustachian tube and salivary duct
(3) Bronchioles and Fallopian tubes
(4) Bile duct and Bronchioles

32. Match the columns.

| | Column–II | | Column–II |
|---|---|---|---|
| (A) | Heart failure | (1) | Heart muscle is suddenly damaged by inadequate blood supply |
| (B) | Cardiac arrest | (2) | Chest pain due to inadequate $O_2$ reaching the heart muscles |
| (C) | Heart attack | (3) | Atherosclerosis |
| (D) | Coronary artery disease | (4) | Heart not pumping blood effectively enough to meet the needs of body (CAD). |
| (E) | Angina pectoris | (5) | Heart stops beating. |

(1) A–4, B–5, C–1, D–3, E–2
(2) A–4, B–5, C–3, D–1, E–2
(3) A–4, B–3, C–5, D–2, E–1
(4) A–5, B–4, C–2, D–3, E–1

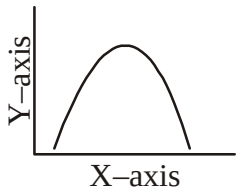
33. Which cross shows loosely incomplete linkage?




(1) Cross A
(2) Cross B
(3) Both (1) and (2)
(4) None of these

34. If females are administered anabolic steroids, which of the following symptoms are observed?
(1) Abnormal menstruation
(2) Excessive hair growth
(3) Enlargement of clitoris
(4) All of these

35. The curve given below shows enzymatic activity with relation to three conditions (pH, temperature and substrate concentration)




What do the two axes (X and Y) represent?

| | X-axis | Y-axis |
|---|---|---|
| (1) | Temperature | Enzyme activity |
| (2) | Substrate concentration | Enzymatic activity |
| (3) | Enzymatic activity | Temperature |
| (4) | Enzymatic activity | pH |

36. Extrusion of second polar body from egg nucleus occurs:
(1) After fertilization
(2) Before entry of sperm into ovum
(3) Simultaneously with first cleavage
(4) After entry of sperm but before fertilization

37. A gene whose expression helps to indentify transformed cell is knows as:
(1) Vector (2) Plasmid
(3) Structural gene (4) Selectable marker

38. Which of the following statement is false?
(1) Insulin stimulates cellular glucose uptake and utilisation and glycogenesis.
(2) Insulin deficiency result in a disease called diabetes mellitus.
(3)Glucagon inhibits glycogenolysis and gluconeogenesis.
(4) Thymosin increases the production of antibodies to provide humoral imunity.

39. Which one of the following pairs is an example of an autosomal recessive disorder?
(1) Phenylketonuria and haemophilia
(2) Colour blindness and haemophilia
(3) Phenylketonuria and thalassemia
(4) Colour blindness and sickle cell anaemia

40. Hormones secreted by the placenta to maintain pregnancy are
(1) hCG, hPL, progestogens, prolactin
(2) hCG, hPL, progestogens, estrogens
(3) hCG, hPL, estrogens, relaxin, oxytocin
(4) hCG, progestogens, estrogens, glucocorticoids