

Test Duration: 60min

Paper Code
CA12A



TALENT SEARCH EXAM

INSTRUCTIONS

1. Immediately fill in the particulars on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.
2. Test duration is **ONE HOUR(60MINUTES)**
3. For Medical stream the Test Booklet consists of **40 questions**, For Non-Medical stream the Test Booklet consists of **30 questions** .
4. There are four sections in the question paper.
The distribution of questions, subject wise in each part is mentioned below:-

PHYSICS	– 10 Questions
CHEMISTRY	– 10 Questions
MATHEMATICS	– 10 Questions
BIOLOGY	– 20 Questions
5. Candidates will be awarded Four marks (+4) each for indicated correct response of each Question& One mark (-1) will be deducted for indicated incorrect response. There will be No deduction from the total score if no response is indicated.
6. No candidate is allowed to carry any textual material, printed or written, bits of paper, mobile phone, any electronic device etc.
7. After the completion of the test, the candidate must hand over the Answer Sheet to the Invigilator On duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.
8. Do not fold or make any stray marks on the Answer sheet.

Name _____ Class: _____

You Can Check Your Answer-Key & Result on www.careeracademy.in



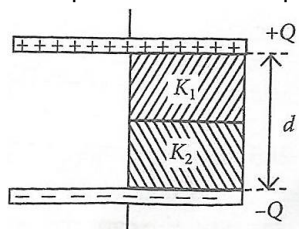
PHYSICS

1. Consider the force F on a charge ' q ' due to a uniformly charged spherical shell of radius R carrying charge Q distributed uniformly over it. Which one of the following statements is true for F , if ' q ' is placed at distance r from the centre of the shell?

(a) $F = \frac{1}{4\pi\epsilon_0} \frac{Qq}{R^2}$ for $r > R$ (b) $\frac{1}{4\pi\epsilon_0} \frac{qQ}{R^2} > F > 0$ for $r < R$

(c) $F = \frac{1}{4\pi\epsilon_0} \frac{Qq}{r^2}$ for $r > R$ (d) $F = \frac{1}{4\pi\epsilon_0} \frac{Qq}{r^2}$ for all r

2. A parallel-plate capacitor with plate A has separation d between the plates. Two dielectric slabs of dielectric constant K_1 and K_2 of same area $A/2$ and thickness $d/2$ are inserted in the space between the plates. The capacitance of the capacitor will be given by



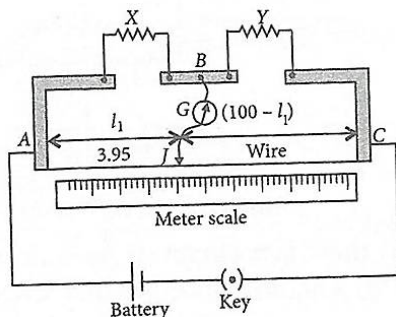
(a) $\frac{\epsilon_0 A}{d} \left(\frac{1}{2} + \frac{K_1 K_2}{K_1 + K_2} \right)$

(b) $\frac{\epsilon_0 A}{d} \left(\frac{1}{2} + \frac{2(K_1 K_2)}{K_1 + K_2} \right)$

(c) $\frac{\epsilon_0 A}{d} \left(\frac{1}{2} + \frac{K_1 + K_2}{K_1 + K_2} \right)$

(d) $\frac{\epsilon_0 A}{d} \left(\frac{1}{2} + \frac{K_1 K_2}{2(K_1 + K_2)} \right)$

- 3.



- (a) 20 cell (b) 40 cell
(c) 60 cell (d) 80 cell.

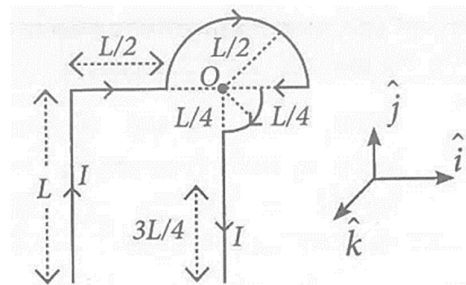
40. Discovery of antibiotic penicillin represent which population interaction
(a) Mutualism (b) Protocooperation
(c) Amensalism (d) Competition.

34. How many of the given disease are caused by bacteria
[Dysentary, Common cold, Malaria, Diphtheria, Ringworm, Pneumonia, Filariasis, Plague, Typhoid]
(a) 2 (b) 3
(c) 4 (d) 5
35. Torniquet test is used to diagnosed
(a) T.B. (b) Chicken gunia
(c) Dengue (d) Malaria.
36. In a STP [Sewage Treatment Plant], arrange the following in a sequence of involvement
A – Anaerobic sludge digester
B – Large aeration tank
C – Primary setting tank
D – Setting tank
(a) C → B → D → A (b) B → A → D → C
(c) B → D → A → C (d) C → B → A → D
37. The adenosine deaminase deficiency result into
(a) Addison's disease **(b) Dysfunction of immune**
(c) Parkinson's disease (d) Liver disease.
38. What is humulin
(a) Humus in soil (b) Deficiency of hormone
(c) Human insulin (d) Human milk protein.
39. The E.coli cells with N¹⁵-dsDNA are incubated in medium containing N¹⁴ nucleotide after 60 minute. How many E.coli cell will have DNA totally free from N¹⁵

In a meter bridge, as shown in the figure, it is given that resistance $Y = 12.5\Omega$ and that the balance is obtained at a distance 39.5 cm from end A (by jockey J). After interchanging the resistances X and Y, a new balance point is found at a distance l_2 from end A. What are the values of X and l_2 ?

- (a) 19.15Ω and 60.5 cm (b) **8.16Ω and 60.5 cm**
(c) 8.16Ω and 39.5 cm (d) 19.15Ω and 39.5 cm

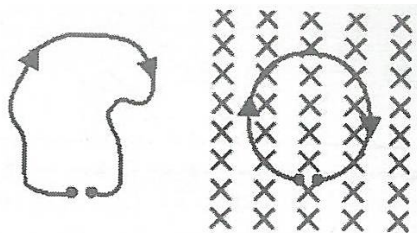
4. Which one of the following options represents the magnetic field \vec{B} at O due to the current flowing in the given wire segments lying on the xy plane?



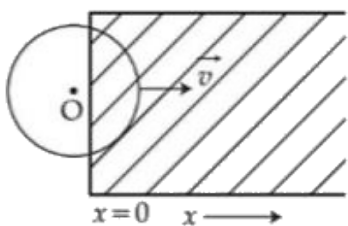
- (a) $\vec{B} = \frac{-\mu_0 I}{L} \left(\frac{3}{2} + \frac{1}{4\sqrt{2}\pi} \right) \hat{k}$ (b) $\vec{B} = \frac{-\mu_0 I}{L} \left(\frac{3}{2} + \frac{1}{2\sqrt{2}\pi} \right) \hat{k}$
(c) $\vec{B} = \frac{-\mu_0 I}{L} \left(1 + \frac{1}{4\sqrt{2}\pi} \right) \hat{k}$ (d) $\vec{B} = \frac{-\mu_0 I}{L} \left(1 + \frac{1}{4\pi} \right) \hat{k}$

5. In an experiment, electrons are accelerated, from rest, by applying a voltage of 500V. Calculate the radius of the path if a magnetic field 100mT is then applied.
[Charge of the electron = $1.6 \times 10^{-19} C$, Mass of the electron = $9.1 \times 10^{-31} kg$]
(a) 7.5 m (b) $7.5 \times 10^{-2} m$
(c) $7.5 \times 10^{-4} m$ (d) $7.5 \times 10^{-3} m$

6. A thin flexible wire of length L is connected to two adjacent fixed points and carries a current I in the clockwise direction, as shown in the figure. When the system is put in a uniform magnetic field of strength B going into plane of the paper, the wire takes the shape of a circle. The tension in the wire is



- (a) IBL (b) $\frac{IBL}{\pi}$
 (c) $\frac{IBL}{2\pi}$ (d) $\frac{IBL}{4\pi}$
7. A constant magnetic field of 1T is applied in the $x < 0$ region. A metallic circular ring of radius 1m is moving with a constant velocity of 1m/s along the x -axis. At $t = 0$ s, the centre O of the ring is at $x = -1\text{m}$. What will be the value of the induced emf in the ring at $t = 1\text{s}$? (Assume the velocity of the ring does not change).

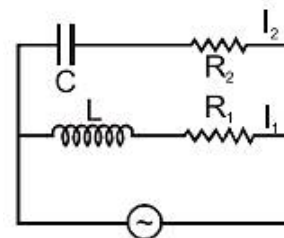


- (a) $0V$ (b) $2V$
 (c) $2\pi V$ (d) $1V$

28. A transgenic food crop which may help in solving the problems of night blindness in developing countries is
 (a) Bt. Brinjal (b) Flavr savr tomato
(c) Golden rice (d) Fortified carrot.
29. In human female, the process of oogenesis is initiated?
 (a) Puberty (b) Birth
 (c) Adult **(d) Embryonic development stage.**
30. Both husband and wife have normal vision though their fathers were colour blind. The probability of their daughter becoming colour blind is
(a) 0% (b) 25%
 (c) 50% (d) 75%
31. In a population the percentage of dominant character is 75%. Find the frequency of alleles
 (a) 25 **(b) 5**
 (c) 35 (d) 20
32. The recombinant frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20% & c & d is 24% and a & d is 29%. What will be the sequence of these gene on a linear chromosome
 (a) a, d, b, c (b) a, b, a, c
 (c) a, b, c, d **(d) a, c, b, d.**
33. Antivenom against snake poison contain
 (a) Antigen (b) Antigen-antibody complex
(c) Antibodies (d) Enzyme.

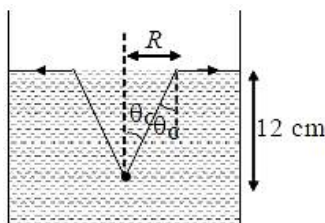
- (a) Zero (b) 1/2
(c) 1/4 (d) 1/8
23. In general diagnosed, the cells of foetus are detected having 2 barrbody. This suggest that developing foetus must be
(a) Down syndrome (b) Turner's syndrome
(c) Klinefelter's syndrome (d) **Super female.**
24. A DNA segment having sequence ATGCCACCAACGCAT, is undergoing transcription find the various type of tRNA that will help in further translation of this mRNA
(a) ATG, CCA, CCA, ACG, CAT (b) **AUG, CCA, CCA, ACG, CAU**
(c) AGG, CAT, TAC, GCA, AUA (d) TAC, GGT, GGT, TGC, GTA.
25. The male gametes of rice plant have 12 chromosome in their nucleus. The chromosome number in female gamete zygote, aleuron layar & cell of seedling will be respectively
(a) 12, 48, 24, 6 (b) 12, 6, 48, 24
(c) **12, 24, 48, 24** (d) 24, 24, 12, 12
26. Total amount of adenine and thymine in a double stranded DNA is 45%. The amount of guanine in this DNA would be
(a) **22.5%** (b) 27.5%
(c) 45 (d) 55%
27. Which sets present convergent evolution
(a) Various function of legs in defect insects
(b) various type of function of mouth parts in different insect
(c) Tiger cat and marsupial mole
(d) **Wolf and Tasmanian wolf.**

8. In the given circuit, $C = \frac{\sqrt{3}}{2} \mu F$, $R_2 = 20 \Omega$, and $R_1 = 10 \Omega$. Current in $L - R_1$ path is I_1 and in $C - R_2$ path it is I_2 . The voltage of A.C source is given by, $V = 200\sqrt{2} \sin(100t)$ volts. The phase difference between I_1 and I_2 is



- (a) 0 (b) 30°
(c) **90°** (d) 60°
9. An EM wave propagating in x-direction has a wavelength of 8 mm. The electric field vibrating y-direction has maximum magnitude of $60V m^{-1}$. Choose the correct equations for electric and magnetic fields if the EM wave is propagating in vacuum.
(a) $\hat{E}_y = 60 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] jV m^{-1}$
 $\hat{B}_z = 2 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{k} T$
(b) $\hat{E}_y = 60 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] jV m^{-1}$
 $\hat{B}_z = 2 \times 10^{-7} \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{k} T$
(c) $\hat{E}_y = 2 \times 10^{-7} \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] jV m^{-1}$
 $\hat{B}_z = 60 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{k} T$
(d) $\hat{E}_y = 2 \times 10^{-7} \sin \left[\frac{\pi}{4} \times 10^3 (x - 4 \times 10^8 t) \right] jV m^{-1}$
 $\hat{B}_z = 60 \sin \left[\frac{\pi}{4} \times 10^4 (x - 4 \times 10^8 t) \right] \hat{k} T$

10. A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $4/3$ and the fish is 12cm below the surface, the radius of this circle (in cm) is



- (a) $36\sqrt{5}$ (b) $4\sqrt{5}$
 (c) $36\sqrt{7}$ (d) $36/\sqrt{7}$

CHEMISTRY

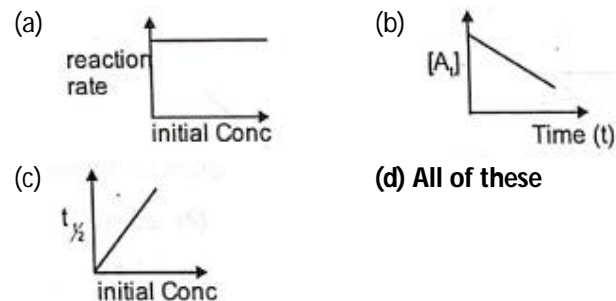
11. 1 mole each of A & B mixed to form ideal solution. [Vapour pressure of A & B in pure form is 20 torr & 80 torr respectively. Calculate the composition of last drop. [X_A & X_B mole fraction of A & B in solution]
- (a) $X_A = 0.8, X_B = 0.1$ (b) $X_A = 0.3, X_B = 0.7$
 (c) $X_A = 0.8, X_B = 0.2$ (d) $X_B = 0.8, X_A = 0.2$
12. $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}; E^\circ = -0.44\text{ V}$
 $\text{Fe}^{3+} + 3\text{e}^- \rightarrow \text{Fe}; E^\circ = -0.036\text{ V}$
 Considering the above data, the standard electrode potential (E°) for $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$ is
- (a) -0.476 V (b) -0.404 V
 (c) 0.404 V (d) $+0.771\text{ V}$
13. Which of the following is correct graph (s) regarding zero order kinetics?

28. Let $\vec{\alpha} = 3\hat{i} + \hat{j}$ and $\vec{\beta} = 2\hat{i} - \hat{j} + 3\hat{k}$. If $\vec{\beta} = \vec{\beta}_1 - \vec{\beta}_2$, where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$, then $\vec{\beta}_1 \times \vec{\beta}_2$ is equal to
- (a) $-3\hat{i} + 9\hat{j} + 5\hat{k}$ (b) $\frac{1}{2}(-3\hat{i} + 9\hat{j} + 5\hat{k})$
 (c) $3\hat{i} - 9\hat{j} - 5\hat{k}$ (d) $\frac{1}{2}(3\hat{i} - 9\hat{j} + 5\hat{k})$
29. An urn contains 5 red and 2 green balls. A ball is drawn at random from the urn. If the drawn ball is green then a red ball is added to the urn and if the drawn ball is red then a green ball is added to the urn; the original ball is not returned to the urn. How a second ball is drawn at random from it. The probability that the second ball is red is
- (a) $\frac{27}{49}$ (b) $\frac{32}{49}$
 (c) $\frac{21}{49}$ (d) $\frac{26}{49}$
30. Let f be a function such that $f(x + f(y)) = f(x) + y \forall x, y \in R$, then find $f(0)$. It is given that there exist a positive real δ such that $f(h) = h$ for $0 < h < \delta$ then find $f'(x)$
- (a) 0,1 (b) $-1,0$
 (c) 2,1 (d) $-2,0$

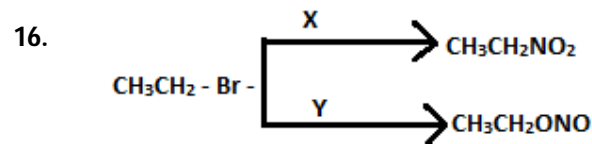
BIOLOGY

21. A diploid organism is heterozygous for 8 loci. How many types of gametes can be produced
- (a) 8 (b) 16
 (c) 128 (d) 256
22. Mr. Sharma has Bb autosomal gene pair and d allele sex linked. What shall be proportion of Bd in sperms

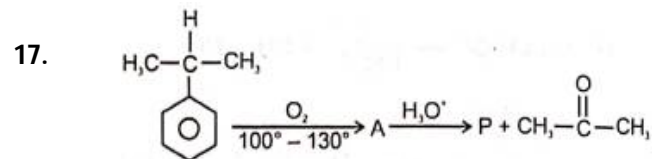
23. If $[x]$ is the greatest integer $\leq x$, then $\pi^2 \int_0^2 \sin\left(\frac{\pi x}{2}\right) (x - [x]^{[x]}) dx$ is equal to
 (a) $2(\pi + 1)$ (b) $4(\pi - 1)$
 (c) $4\pi + 1$ (d) $2\pi + 1$
24. The area (in square units) of the region $A = \{(x, y) \in R \times R : 0 \leq x \leq 3, 0 \leq y \leq 4, y \leq x^2 + 3x\}$ is
 (a) $\frac{53}{6}$ (b) $\frac{59}{6}$
 (c) 8 (d) $\frac{26}{3}$
25. Let $f: [0,1] \rightarrow R$ be such that $f(xy) = f(x) \cdot f(y)$ for all $x, y \in [0,1]$ and $f(0) \neq 0$. If $y = y(x)$ satisfies the differential equation $\frac{dy}{dx} = f(x)$ with $y(0) = 1$, then $y\left(\frac{1}{4}\right) + y\left(\frac{3}{4}\right)$ is equal to
 (a) 4 (b) 3
 (c) 5 (d) 2
26. Let $A = [a_{ij}]$ be a square matrix of order 3 such that $a_{ij} = 2^{j-i}$, for all $i, j = 1, 2, 3$. Then the matrix $A^2 + A^3 + \dots + A^{10}$ is equal to
 (a) $\left(\frac{3^{10}-3}{2}\right)A$ (b) $\left(\frac{3^{10}-1}{2}\right)A$
 (c) $\left(\frac{3^{10}+1}{2}\right)A$ (d) $\left(\frac{3^{10}+3}{2}\right)A$
27. One corner of a long rectangular sheet of paper of width 1 unit is folded over so as to reach the opposite edge of the sheet. The minimum length of the crease is
 (a) $\sqrt{2}$ (b) $\frac{1}{2}$
 (c) $\frac{1}{\sqrt{2}}$ (d) none



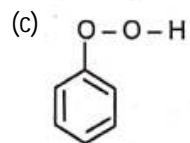
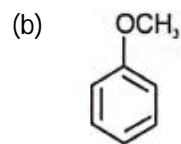
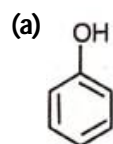
14. Select the statement that is correct
 (a) $K_2Cr_2O_7$ is good oxidising agent
 (b) $K_2Cr_2O_7$ is used as primary standard in volumetric analysis
 (c) On heating $K_2Cr_2O_7$ forms a green colour compound
 (d) All of these
15. The hybridization of Fe in brown ring complex be
 (a) sp^3d (b) sp^3d^2
 (c) sp^3 (d) sp^2d



- Reagent y and x used for the above conversion respectively are
 (a) $AgNO_2$ and KNO_2 (b) $AgNO_2$ in both
 (c) KNO_2 in both (d) KNO_2 and $AgNO_2$



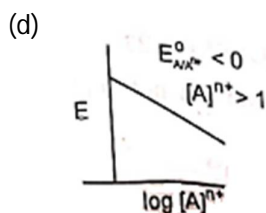
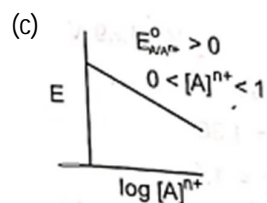
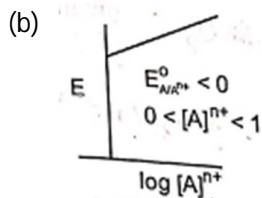
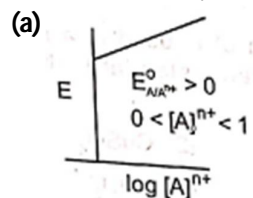
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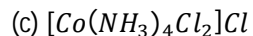
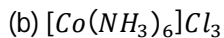
(d) both (a) and (c)

18. For oxidation reaction
- $A \rightarrow A^{n+} + ne^-$
- nernst equation is

$$E = E_{A/A^{n+}}^{\circ} - \frac{0.059}{n} \log [A^{n+}]$$
 curve is

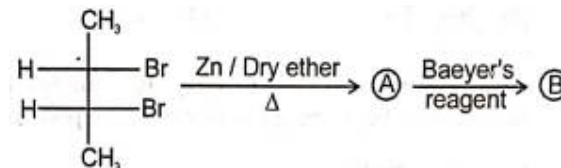


19. A complex is represented as
- $\text{CoCl}_3 \cdot x\text{NH}_3$
- . Its 0 molar solution in water shows melting point 0.558K. (
- K_f
- of
- $\text{H}_2\text{O} = 1.86 \text{ K molality}^{-1}$
-). Assume 100% ionization of complex and coordination number of Co is 6, formula of complex is

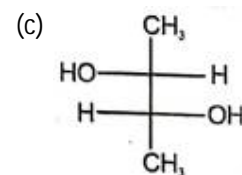
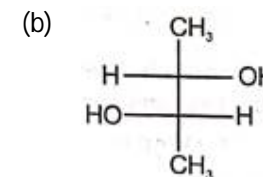
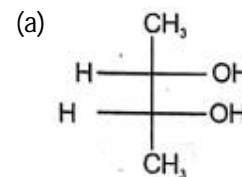


(d) All of these

20.



Identify product (B)



(d) both (b) and (c)

MATHEMATICS

21. The range of the function
- $f(x) = 6^x + 3^x + 3^{-x} + 2$
- in
-
- (a)
- $[-2, \infty)$
- (b)
- $(-2, \infty)$
-
- (c)
- $(6, \infty)$
- (d)
- $[6, \infty)$

22. The integral
- $\int \sqrt{1 + 2\cot x (\operatorname{cosec} x + \cot x)} dx$
- (
- $0 < x < \pi/2$
-) is equal to (where
- C
- is constant of integration)

(a) $2 \log \left(\sin \frac{x}{2} \right) + C$

(b) $2 \log \left(\cos \frac{x}{2} \right) + C$

(c) $4 \log \left(\cot \frac{x}{2} \right) + C$

(d) $4 \log \left(\sin \frac{x}{2} \right) + C$