



D.A.V GROUP, CHENNAI
COMMON QUARTERLY EXAMINATION (2024-2025)

PHYSICS (042)

Class : XII

Time: 3 hours

Date : 25.09.2024

Max. Marks: 70

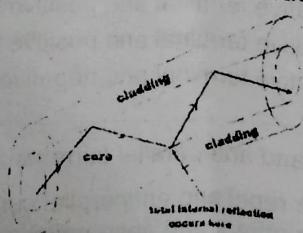
General Instructions:

- (i) There are 33 questions in all. All questions are compulsory.
- (ii) This question paper has five sections: **Section A**, **Section B**, **Section C**, **Section D** and **Section E**.
- (iii) **Section A** contains twelve MCQ and four Assertion / Reasoning of one mark each. **Section B** has five questions of two marks each. **Section C** contains seven questions of three marks each. **Section D** contains two case based questions of four marks each and **Section E** contains three long questions of five marks each.
- (iv) There is no overall choice. However internal choice has been provided in one question in **Section B**, **Section C**, **Section D** and all three questions in **Section E**. You have to attempt only one of the choices in such questions.
- (v) Use of a calculator is not allowed.
- (vi) You may use the following values of physical constants wherever necessary.

$$c = 3 \times 10^8 \text{ m/s}, \epsilon_0 = 8.854 \times 10^{-12} \text{ m}^3 \text{ g}^{-1} \text{ s}^4 \text{ A}^2, \mu_0 = 4\pi \times 10^{-7} \text{ H/m}$$

Q.No.		Marks
	SECTION A	(16 x 1 = 16 m)
1.	An electric dipole placed in an electric field of intensity $2 \times 10^5 \text{ N/C}$ at an angle of 30° experiences a torque equal to 4 Nm. The charge on the dipole of dipole length 2 cm is A) 7 mC B) 2 mC C) 8 mC D) 5 mC	1
2.	A uniform electric field is along Y-direction in a certain region. The co-ordinates of points A, B and C are (0, 0), (2, 0) and (0, 2) respectively. Which of the following alternatives is true for the potential of these points ? A) $V_A = V_B, V_A > V_C$ B) $V_A > V_B, V_A = V_C$ C) $V_A < V_C, V_B = V_C$ D) $V_A = V_B, V_A < V_C$	1
3.	In a DC circuit, the direction of current inside the battery and outside the battery respectively are A) positive to negative terminal and negative to positive terminal B) positive to negative terminal and positive to negative terminal C) negative to positive terminal and positive to negative terminal D) negative to positive terminal and negative to positive terminal	1
4.	The nature of parallel and anti-parallel currents are A) parallel currents repel and antiparallel currents attract. B) parallel currents attract and antiparallel currents repel. C) both currents attract. D) both currents repel.	1

5.	A capacitor has capacitance C and reactance X, if capacitance and frequency become double, then reactance will be A) $4X$ B) $X/2$ C) $X/4$ D) $2X$	1																
6.	The current in the primary coil of a pair of coils changes from 7 A to 3 A in 0.04 s. The mutual inductance between the two coils is 0.5 H. The induced emf in the secondary coil is A) 50 V B) 75 V C) 100 V D) 220 V	1																
7.	Three students construct a solenoid of length 35 cm. They are each given insulated copper wire of the same length. The table below lists some details about the solenoids made by them.	1																
	<table border="1"> <thead> <tr> <th>Category →</th><th>Magnetic Field</th><th>Radius of the solenoid</th><th>Core of the solenoid</th></tr> </thead> <tbody> <tr> <td>Student - 1</td><td>B_1</td><td>3 cm</td><td>Air</td></tr> <tr> <td>Student - 2</td><td>B_2</td><td>3 cm</td><td>Soft Iron</td></tr> <tr> <td>Student - 3</td><td>B_3</td><td>6 cm</td><td>Air</td></tr> </tbody> </table> <p>Compare the magnetic field produced by the solenoids made by the three students.</p> <p>A) $B_1 = B_3 < B_2$ B) $B_3 < B_1 < B_2$ C) $B_1 < B_2 < B_3$ D) $B_1 = B_2 > B_3$</p>	Category →	Magnetic Field	Radius of the solenoid	Core of the solenoid	Student - 1	B_1	3 cm	Air	Student - 2	B_2	3 cm	Soft Iron	Student - 3	B_3	6 cm	Air	
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Student - 3	B_3	6 cm	Air															
8.	The polarity of induced emf is defined by A) Ampere's circuital law. B) Biot-Savart law. C) Lenz's law. D) Fleming's right hand rule.	1																
9.	In a step-down transformer, the number of turns in the secondary coil is 20 and the number of turns in the primary coil is 100. If the voltage applied to the primary coil is 120 V, then what is the voltage output from the secondary coil? A) 24 V B) 12 V C) 6 V D) 18 V	1																
10.	In an optical fibre (shown), correct relation for refractive indices of core n_1 and cladding n_2 is A) $n_1 = n_2$ B) $n_1 > n_2$ C) $n_1 < n_2$ D) $n_1 + n_2 = 2$	1																



11. Match the correct units of the given Magnetic quantities from the table.

1

Magnetic Quantities		Units	
i.	Magnetic moment	a.	A/m
ii.	Magnetic Induction	b.	Tm/A
iii.	Magnetic permeability	c.	T
iv.	Magnetisation	d.	Am ²

A) i- b; ii- d; iii- a; iv- c

B) i- d; ii- c; iii- b; iv- a

C) i- a; ii- c; iii- d; iv- b

D) i- c; ii- b; iii- a; iv- d

12. Waves in decreasing order of their wavelength are

1

A) X-rays, infrared rays, visible rays, radio waves.

B) visible rays, radio waves, infrared rays, X-rays.

C) radio waves, infrared rays, visible rays, X-rays.

D) ultraviolet rays, radio waves, visible rays, X-rays.

For questions 13 to 16, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes A), B), C) and D) as given below

- A) If both A and R are true and the R is a correct explanation of A
 B) If both A and R are true but R is NOT the correct explanation of A
 C) If A is true but R is false
 D) If A is false and R is true.

13. Assertion (A): When radius of a current carrying loop is halved, its magnetic moment increases four times.

1

Reason (R): The magnetic moment of a current carrying loop is directly proportional to the area of the loop.

14. Assertion (A): The average time of collisions τ , decreases with increasing temperature.

1

Reason (R): At increased temperature, average speed of the electrons, which act as the carriers of current, increases, resulting in more frequent collisions.

15. Assertion (A) : The ability of a material to permit the passage of magnetic lines of force through it is called magnetic permeability.

1

Reason (R) : For a perfect diamagnetic substance, permeability is always one.

16. Assertion (A) : Electromagnetic waves are transverse in nature

1

Reason (R) : The electric and magnetic fields in electromagnetic waves are parallel to each other.

SECTION B

(5 x 2 = 10 m)

17. The two point charges $+4 \mu\text{C}$ and $+1 \mu\text{C}$ are separated by a distance of 2 m in air. Find the point on the line joining the charges at which net electric field of the system is zero. 2
18. Write an expression for the force F acting on a particle of mass m and charge q moving with velocity V in a magnetic field B . Under what conditions will it move in (i) a circular path and (ii) a helical path? 2
19. A battery of emf 12 V and internal resistance 4 is connected to an external resistance R . If the current in the resistance is 0.5 A, calculate the value of the external resistance R , and the terminal voltage of the battery. 2
20. Mention any two losses in a transformer during power transmission and also mention how they can be minimized. 2
21. How are infrared waves produced? Why are these waves referred to as heat waves? Give any two uses of infrared waves. 2
- (OR)
- Name the part of electromagnetic spectrum whose wavelength lies in the range of 10^{-10} m. Write any two uses of the given wave.

SECTION C

(7 x 3 = 21 m)

22. a) Define an ideal dipole. Give an example. 3
- b) Depict the orientation of an electric dipole in (a) stable and (b) unstable equilibrium in an external uniform electric field. Write the potential energy of the dipole in each case.
23. a) Calculate the amount of work done to dissociate a system of three charges $1 \mu\text{C}$, $1 \mu\text{C}$ and $-4 \mu\text{C}$ placed on the vertices of an equilateral triangle of side 10 cm. 3
- b) Draw a graph showing the variation of electric field intensity, E with r , for $r < R$ and $r > R$ for a uniformly charged spherical shell of radius R .
24. The following table gives the length of three copper wires, their diameters and the applied potential difference across their ends. Arrange the wires in increasing order according to the following: 3
- the magnitude of the electric field within them.
 - the drift speed of electrons through them.
 - the current density within them.

Wire No.	Length	Diameter	Potential difference
1	$3L$	$3d$	$2V$
2	L	d	$V/2$
3	$L/2$	$2d$	V

25.	<p>Use Biot-Savart law to derive the expression for the magnetic field on the axis of a current carrying circular loop of radius R. (OR) Derive the expression for the torque acting on a current carrying loop placed in a magnetic field. Why is the magnetic field radial in a moving coil galvanometer? Explain how it is achieved.</p>	3
26.	<p>a) Mention any two properties of magnetic field lines around a bar magnet.</p> <p>b) A short bar magnet is placed in a uniform magnetic field of 0.2 T with its axis at an angle 30° experiences a torque of 0.06 Nm. Calculate the magnetic moment of the magnet.</p>	3
27.	<p>a) An alternating voltage of 220 V is applied across a device X. A current of 0.22 A flows in the circuit and it lags behind the applied voltage in phase by $\pi/2$ radian. When the same voltage is applied across another device Y, the current in the circuit remains the same and it is in phase with the applied voltage.</p> <p>i) Name the devices X and Y</p> <p>ii) Calculate the current flowing in the circuit when the same voltage is applied across the series combination of X and Y.</p> <p>b) What is wattless current?</p>	3
28.	<p>a) Calculate the speed of light in a medium whose critical angle is 30°.</p> <p>b) An object is placed at a certain distance from a convex lens of focal length 20 cm. Find the distance of the object if a virtual image of magnification 4 is obtained. Draw the image formation for the same.</p>	3
SECTION D		$(2 \times 4 = 8 \text{ m})$
29.	<p>Read the following paragraph and answer the questions that follows:</p> <p>Moving coil galvanometer operates on Permanent Magnet Moving Coil (PMMC) mechanism and was designed by the scientist D'arsonval.</p> <p>Moving coil galvanometers are of two types</p> <p>(i) Suspended coil</p> <p>(ii) Pivoted coil type or tangent galvanometer</p> <p>Its working is based on the fact that when a current carrying coil is placed in a radial magnetic field, it experiences a torque. This torque tends to rotate the coil about its axis of suspension in such a way that the magnetic flux passing through the coil is maximum.</p> <p>i) Phosphor-bronze wire is used in suspension because it has</p> <ul style="list-style-type: none"> A) A large couple per unit twist B) A small couple per unit twist C) Low conductivity D) High Sensitivity 	4

- ii) A moving coil galvanometer can be converted into an ammeter by
- introducing a shunt resistance of large value in series.
 - introducing a shunt resistance of small value in parallel.
 - introducing a resistance of small value in series.
 - introducing a resistance of large value in parallel
- iii) The current sensitivity of a galvanometer is defined as
- deflection per unit current
 - current per unit deflection.
 - deflection per unit current when a unit voltage is applied across its terminals.
 - the current flowing through the galvanometer when a unit voltage is applied across its terminals.
- iv) The deflection in a moving coil galvanometer is
- directly proportional to torsional constant of spring.
 - inversely proportional to the area of the coil.
 - inversely proportional to the current in the coil.
 - directly proportional to the number of turns in the coil.

(OR)
The deflection θ is related to the electric current I in a galvanometer by the relation

- $I \propto \theta$
- $I \propto \tan \theta$
- $I \propto \sin \theta$
- $I \propto \cos \theta$

30. Read the following paragraph and answer the questions that follows:

4

Refraction is the redirection of a wave as it passes from one medium to another. The redirection can be caused by the change in speed of light in different medium. Optical prisms and lenses use refraction to redirect light, as does the human eye. The refractive index of materials varies with the wavelength of light, and thus the angle of the refraction also varies correspondingly. Prisms and raindrops split white light into its constituent spectral colors due to dispersion of light. The speed of light is slower in a medium other than vacuum. Optical density is the ability of a material to transmit light through it. The power of a lens is defined as the reciprocal of its focal length in meters.

- i) The deviation through a prism is maximum when angle of incidence is
- 45°
 - 70°
 - 90°
 - 60°
- ii) A substance is behaving as convex lens in air and concave in water, then its refractive index is
- greater than air but less than water.
 - greater than both air and water
 - smaller than air
 - almost equal to water

- iii) The focal length of a biconvex lens of radii of each surface 50 cm and refractive index 1.5, is
- 40.4 cm
 - 75 cm
 - 50 cm
 - 80 cm

- iv) We combine two lenses, one is convex and other is concave having focal lengths f_1 and f_2 and their combined focal length is F . When the lenses are combined, they act like a concave lens, if
- $f_1 > f_2$
 - $f_1 = f_2$
 - $f_1 < f_2$
 - $f_1 \leq f_2$

(OR)

A convex lens and a concave lens, each having the same focal length of 25 cm, are put in contact to form a combination of lenses. The combination's power (in dioptres) is

- zero
- 25
- 50
- infinity

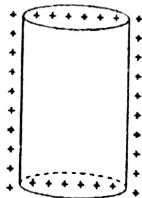
SECTION E

(3 x 5 = 15m)

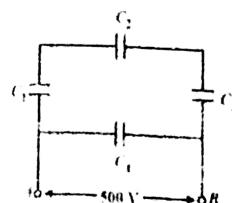
31. a) Sketch the pattern of electric field lines due to an electric dipole. 5
 b) A 600 pF capacitor is charged by a 200 V supply. It is then disconnected from the supply and is connected to another uncharged 600 pF capacitor. How much electrostatic energy is lost in the process?

(OR)

- a) Sketch the electric field lines for a uniformly charged hollow cylinder shown in figure.



- b) A network of four capacitors each of $12 \mu\text{F}$ capacitance is connected to a 500 V supply as shown in the figure. Determine
 i) the equivalent capacitance of the network and
 ii) charge on each capacitor.



32.

5

- a) A horizontal conducting rod 10 m long extending from east to west is falling with a speed of 5.0 m/s at right angles to the horizontal component of earth's magnetic field, 0.3×10^{-4} Wb/m². Find the instantaneous value of e.m.f. induced in the rod.
- b) Derive the expression for the self inductance of a long solenoid of cross sectional area A and length l, having n turns per unit length.
- c) State Faraday's law of electromagnetic induction.

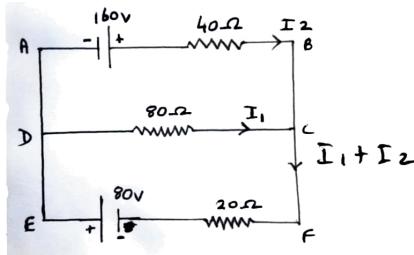
(OR)

- a) Derive an expression for induced emf developed when a coil of N turns, and area of cross -section, A is rotated at a constant angular speed in uniform magnetic field B.
- b) Show the variation of the emf generated versus time as the armature is rotated with respect to the direction of the magnetic field.
- c) State Lenz's law of electromagnetic induction.

33.

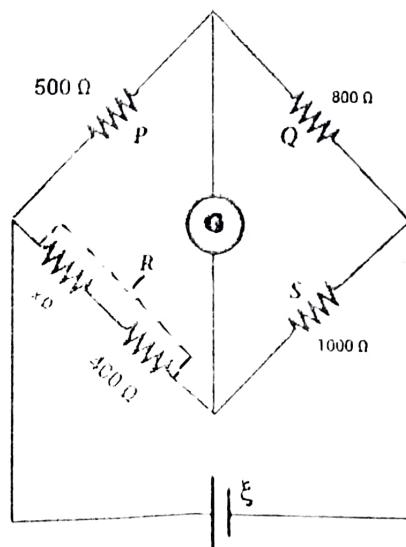
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State Kirchhoff's rules. Using Kirchhoff's rules, calculate the current through 80Ω and 40Ω resistors in the following circuit.



(OR)

What is the value of x when the Wheatstone's network is balanced?



A moving coil galvanometer of resistance 55Ω produces a full scale deflection for a current of 250 mA . How will you convert it into an ammeter with a range of $0 - 3\text{ A}$?



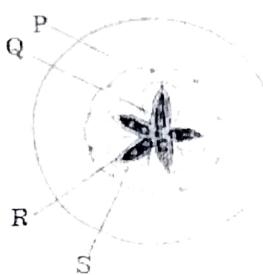
D.A.V GROUP, CHENNAI
COMMON QUARTERLY EXAMINATION (2024-2025)
Biology (044)

CLASS: XII
DATE: 27.09.2024

TIME: 3 HOURS
MARKS: 70

General Instructions:

- All questions are compulsory
- The question paper has five sections and 33 questions. All questions are compulsory
- Section-A has 16 questions of 1 mark each, Section-B has 5 questions of 2 marks each; Section-C has 7 questions of 3 marks each; Section-D has 2 case-based questions of 4 marks each; and Section-E has 3 questions of 5 marks each.
- There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION A		Marks
Q.No	Question	
1.	<p>Select the option that correctly matches with the labelling in the given diagram of TS. of an apple which categorizes it as a false fruit.</p>  <p>a) P-Thalamus a) Q-Seed b) R-Endocarp c) S-Mesocarp</p>	1
2.	<p>Refer to the Venn diagram given below. Select the option with correct examples P, Q, and R:</p>  <p>a) P - Castor, Q - Onion, R - Wheat b) P - Bean, Q - Castor, R - Maize c) P - Pea, Q - Gram, R - Barley d) P - Coconut, Q - Rubber, R - Groundnut</p>	1

3. Concentration of which of the following substances will decrease in the maternal blood as it flows from embryo to placenta through the umbilical cord?

- i) Oxygen ii) Amino Acids iii) Carbon dioxide iv) Urea
- a) i) and ii)
b) ii) and iv)
c) iii) and iv)
d) i) and iv)

4. During parturition, a pregnant woman is having prolonged labour pains and child birth has to be fastened. It is advisable to administer a hormone that can

- a) increase the metabolic rate.
b) release glucose in the blood.
c) stimulate the ovary.
d) activate smooth muscles

5. The mode of action of the copper ions in an IUD is to

- a) increase the movement of sperms.
b) decrease the movement of the sperms.
c) make the uterus unsuitable for implantation.
d) make the cervix hostile to the sperms.

6. A person with trisomy of 21st chromosome shows

- (i) Furrowed tongue
(ii) Characteristic palm crease
(iii) Rudimentary ovaries
(iv) Gynaecomastia

Select the correct option, from the choices given below:

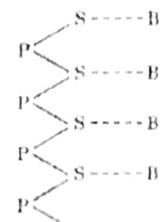
- a) (ii) and (iv)
b) (i), (ii) and (iv)
c) (ii) and (iii)
d) (i) and (ii)

7. Among the seven pairs of contrasting traits in pea plant studied by Mendel, number of traits related to flower, pod and seed were respectively:

- a) 2,1,2
b) 2,2,2
c) 1,2,1
d) 1,1,2

8. The type of bond represented by the dotted line '---' in a schematic polynucleotide chain is:

(Hint: P – Phosphate, S – Sugar, B – Heterocyclic compound)



- a) Hydrogen bond
b) Peptide bond
c) N-glycosidic linkage
d) Phosphodiester bond

9. If the sequence of nitrogen bases of the coding strand in a transcription unit is 5'-ATGAATG-3', the sequence of bases in its RNA transcript would be

- a) 5' - AUGAAUG - 3'
b) 5' - UACUUAC - 3'
c) 5' - CAUUCAU - 3'
d) 5' - GUAAGUA - 3'

10.	S.L. Miller in 1953, to support the theory of chemical evolution, created conditions in the closed flask that included: a) CH ₃ , O ₂ , NH ₃ , H ₂ O vapour at 1800°C b) CH ₄ , H ₂ , NH ₃ , H ₂ O vapour at 800°C c) CH ₄ , CO ₂ , H ₂ , H ₂ O vapour at 1800°C d) CH ₄ , NH ₄ , SO ₂ , H ₂ O vapour at 800°C	1
11.	Identify the option that gives the correct type of evolution exhibited by the two animals shown, living in the same habitat in Australia.	1



Mouse



Marsupial mouse

- a) Convergent Evolution
- b) Disruptive Selection
- c) Divergent Evolution
- d) Homologous Ancestry

12.	The specific Bt toxin genes which protect the cotton plants against the cotton bollworms are: a) Cry-I Ac and Cry-II Ab b) Cry-I Ab and Cry-I Bc c) Cry-II Ac and Cry-I Ac d) Cry-II Ab and Cry-I Ab	1
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Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true and R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

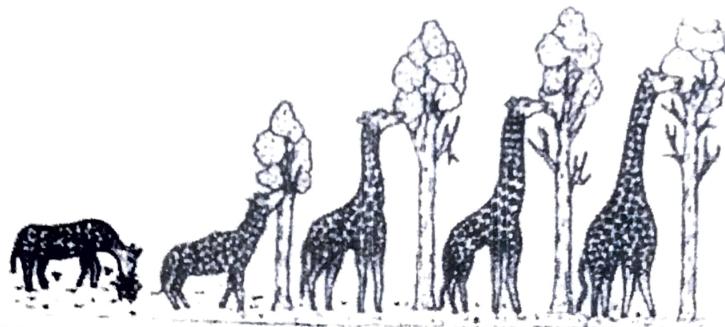
13.	Assertion (A): Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby. Reason (R): Colostrum secreted by the mother during initial days of lactation contains several antibodies absolutely essential to develop resistance for the new-born babies.	1
14.	Assertion (A): Cervical caps and vaults are barrier methods of contraception used by human females. Reason (R): They prevent conception by phagocytosis of sperms.	1
15.	Assertion (A): In Thalassemia an abnormal myoglobin chain is synthesized due to a gene defect. Reason (R): α -Thalassemia is controlled by genes HBA1 and HBA2 on chromosome 16.	1
16.	Assertion (A): For DNA sequencing, the total DNA from a cell is isolated and converted into random fragments of relatively smaller sizes. Reason (R): Human genome is said to have approximately 3×10^9 bp and the total estimated cost for sequencing is very high.	1

SECTION B

17.	Explain the process of formation of male gametophyte in angiosperms	2
18.	a) State what is Seminal Plasma. b) Mention its constituents and function	2

19. DNA replication is continuous and discontinuous on the two strands within the replication fork. Explain with the help of a schematic representation.

20. Observe the picture given below. Name the naturalist and write the explanation given by him that evolution of life forms had occurred on the basis of this example.



21. a) How have transgenic animals proved to be beneficial in the study of chemical safety testing? How is this testing advantageous to mankind?

OR

- b) Vectors are DNA molecules that can carry a foreign DNA segment into the host cell.
- Write the significance of 'ori' in this vector.
 - Give one example each of vectors used for cloning genes in plants and animals respectively.

SECTION C

22. a) State why plant breeders are interested in artificial hybridisation programme.

b) How do they carry out this process?

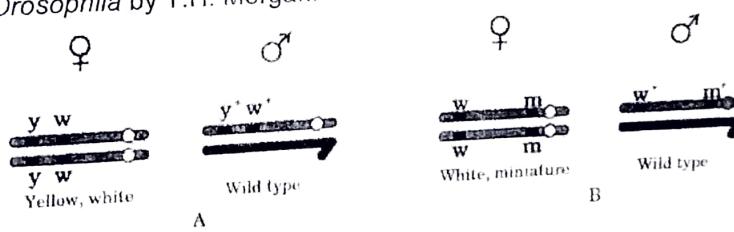
3

23. Explain the IUI and IUT methods of assisted reproductive technologies.

3

24. Study the diagrammatic representation of the chromosomes with locations of the genes of two traits, based on the dihybrid cross carried in *Drosophila* by T.H. Morgan.

3



Answer the questions that follow:

- Identify the traits denoted by 'y' and 'm'.
- What was the percentage of recombinants obtained in Cross A and Cross B respectively by Morgan?
- Write the explanation that Morgan gave for such a percentage.

25. Describe the events of spermatogenesis with the help of a schematic representation.

3

26. a) How many types of RNA polymerases are there in a eukaryotic cell? Mention which one of them transcribes hnRNA.

3

	b) Write the changes that hnRNA undergoes before it leaves the nucleus as mRNA.	
27.	a) Industrial melanism in England after 1850 is an excellent example of Natural selection. Explain how? OR b) i) Name the two primate ancestors of the present day humans, who existed approximately about 15 million years ago. ii) According to geological records, when and where did <i>Australopithecines</i> live? iii) Give two differences between <i>Homo habilis</i> and <i>Homo erectus</i> .	3
28.	The first clinical gene therapy was given in 1990 to a 4-year-old girl with ADA deficiency. a) Mention the cause of this disorder. b) List the possible treatments available for this disorder. c) How can this disorder be cured permanently?	3
	SECTION D	
	Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.	
29.	Gene expresses itself in a cell system as a protein/enzyme. How does an expression of gene occur in a cell system and when does it need to occur, and how the gene expression is regulated in a prokaryote cell system was studied by the combined efforts of Jacque Monod, the biochemist and Francois Jacob, the geneticist. For their work on lactose metabolism in <i>E. coli</i> and introducing the concept of "lac operon" they were awarded the Nobel Prize in 1960. a) Why is lac operon said to be a transcriptionally regulated system? b) "The lac operon has to be operational at a very low level in the bacterial cell all the time." Justify c) Draw a schematic diagram of lac operon in absence of inducer in the culture medium of the bacteria. OR c) Draw a schematic diagram of lac operon in the presence of inducer in the culture medium of the bacteria.	4
30.	In recombinant DNA technology, restriction enzymes are used as they recognize and cut DNA within a specific recognition sequence. BamH I is one such restriction enzyme which binds at the recognition sequence 5' G-G-A-T-C-C 3' and cleaves this sequence between G and G on each strand, whereas Alu I binds at the recognition sequence 5' A-G-C-T 3' and cleaves these sequences between G and C on each strand. a) Write the specific sequence of DNA segment recognised by the restriction endonuclease EcoRI. b) Which one of the two restriction enzymes BamH I or Alu I will preferably be used on the same given DNA strand to make a recombinant DNA molecule and why? c) After binding to the two strands of the double helix DNA, where specifically does the restriction enzyme act to cut the two strands of DNA? Write the specific term used for the specific nucleotide sequence of DNA recognised by a restriction endonuclease.	4

OR

- c) If Alu I is used to cut the given DNA strand, how many DNA fragments would be formed? Write the sequence of each fragment formed with its polarity.

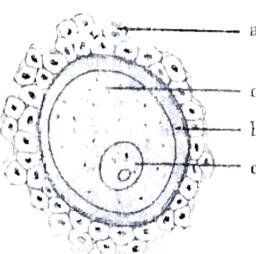
5' C - C - G - T - A - G - C - T - A - T - C - A - G - C - T - G - G - 3'
 3' G - G - C - A - T - C - G - A - T - A - G - T - C - G - A - C - C - 5'

SECTION E

- 31 a) (i) Why do plants like *Viola* and *Oxalis* give assured seed sets even in the absence of pollinators?
 (ii) When an orange seed is squeezed, many embryos of different shapes and sizes are observed. Why?
 (iii) Mention two advantages of seed formation to angiosperms.
 (iv) Draw a diagram of a fertilized embryo sac of an angiosperm and label any four parts.

OR

- b) Given below is a diagrammatic representation of a human ovum.

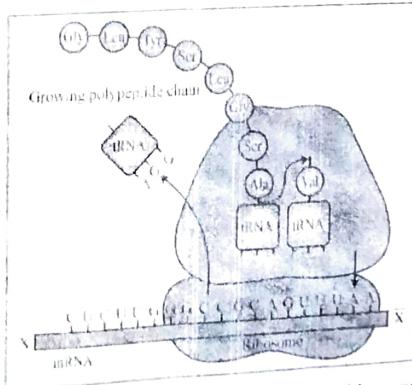


- (i) Identify the parts 'a', 'b' and 'c'
 (ii) This ovum is released from the ovary with incomplete meiotic division. When, where and how is the meiotic division completed?
 (iii) How does an ovum ensure the entry of a single sperm during fertilisation?

32. a) "The influence of both the alleles in a heterozygous state is clearly expressed in codominance." Explain with the help of inheritance of ABO blood group in humans. 5

OR

- b) Study the schematic diagram given below and answer the questions that follow:



- (i) Identify the polarity from X to \bar{X} in the mRNA segment shown. Mention how many more amino acids can be added to the polypeptide that is being translated and why.
 (ii) Write the initiating codon for translation, its anticodon and the amino acid it codes for.

	<p>(iii) Explain the charging of an adapter molecule. Why this molecule needs to be charged?</p>	
33.	<p>a) (i) Why should a cell be made competent to take up an alien DNA? How can a bacterial cell be made competent using calcium ions? Explain.</p> <p>(ii) (a) State the importance of gel electrophoresis in biotechnology. (b) Explain the principle on which this technique works. (c) Mention why ethidium bromide is used in this technique.</p> <p>OR</p> <p>b) (i) Name the nematode (scientific name) that infects the roots of tobacco plant and reduces its yield. (ii) Name the vector that is used to introduce nematode-specific genes into the host plant. (iii) How do sense and anti-sense RNAs function? (iv) Why could parasite not survive in a transgenic host plant?</p>	5



Class: XII

D.A.V. GROUP

COMMON QUARTERLY EXAMINATION MATHEMATICS (041) (2024-2025)

Date: 03.10.2024

Time: 3 HRS

Max. Marks: 80

General Instructions:

1. This Question Paper contains –five sections A, B, C, D and E. Each section is Compulsory.
2. Section A has 18 MCQ's and 02 Assertion –Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of Assessment (4 marks each) with sub parts.

SECTION A (Multiple Choice Questions) Each question carries 1 mark.

1. The relation R on the set $A = \{x: x \in \mathbb{Z}, 0 \leq x \leq 12\}$ defined by $R = \{(a, b): |a - b| \text{ is a multiple of } 4\}$, then equivalence class of 1 is

(a) {1,5,9} (b) {0,1,2,5} (c) \emptyset (d) A
2. If $|x| < 1$, then $2\tan^{-1}x + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is equal to

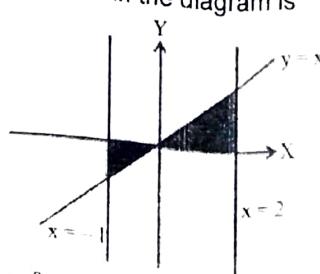
(a) π (b) 0 (c) $\frac{\pi}{2}$ (d) $4\tan^{-1}x$
3. The value of $\cos(\tan^{-1}\tan\frac{15\pi}{4})$ is

(a) 0 (b) $\frac{1}{\sqrt{2}}$ (c) $-\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$
4. The set of all points where the function $x + |x|$ is differentiable is

(a) $(0, \infty)$ (b) $(-\infty, 0)$ (c) $(-\infty, 0) \cup (0, \infty)$ (d) $(-\infty, \infty)$
5. If $y = \log_{\sqrt{e}}(\sin x)$, then the value of $\frac{dy}{dx}$ is

(a) $\sqrt{e}\cot x$ (b) $\frac{1}{\sqrt{e}\cot x}$ (c) $2\cot x$ (d) $\frac{1}{2\cot x}$
6. If $x = a \sec \theta$, $y = b \tan \theta$, then $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{6}$ is

(a) $\frac{-3\sqrt{3}b}{a^2}$ (b) $\frac{-2\sqrt{3}b}{a^2}$ (c) $\frac{-3\sqrt{3}b}{a}$ (d) $\frac{-b}{3\sqrt{3}a^2}$
7. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x^2 \sin x \, dx$ is

(a) ∞ (b) 0 (c) 1 (d) $\frac{1}{2}$
8. Area of the shaded region shown in the diagram is
 

Y
X

(a) $\frac{5}{2}$ (b) $\frac{3}{2}$ (c) 0 (d) 4

9. Given $\int 2^x \, dx = f(x) + C$, then $f(x)$ is

(a) 2^x (b) $\frac{2^{x+1}}{x+1}$ (c) $\frac{2^x}{\log_e 2}$ (d) $2^x \log_e 2$

10. Maximum value of $x + \cos x$ in $[0, \frac{\pi}{2}]$ is
 (a) $\frac{\pi}{2} + 1$ (b) $\frac{\pi}{2} - 1$ (c) $-1 + \pi$ (d) $\frac{\pi}{2}$

11. In the interval $(1, 2)$, the function $f(x) = 2|x - 1| + 3|x - 2|$ is
 (a) strictly increasing (b) strictly decreasing
 (c) Neither increasing nor decreasing (d) Remains constant.

12. Derivative of $e^{\sin^2 x}$ with respect to $\cos x$ is
 (a) $\sin x e^{\sin^2 x}$ (b) $\cos x e^{\sin^2 x}$ (c) $-2\cos x e^{\sin^2 x}$ (d) $-2\sin^2 x \cos x e^{\sin^2 x}$

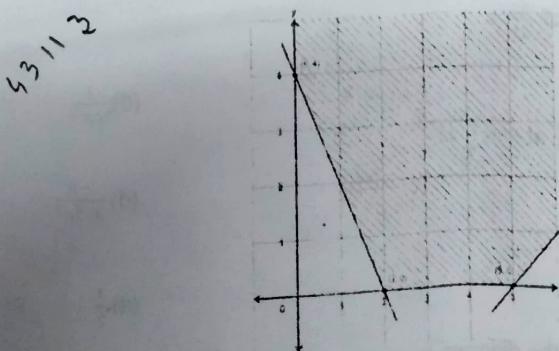
13. The matrix $P = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a
 (a) square matrix (b) diagonal matrix (c) unit matrix (d) scalar matrix

14. If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix, then the value of $a + c - b$ is
 (a) -5 (b) 5 (c) 0 (d) 1

15. Which of the following is true
 (a) Transpose of a column matrix is a column matrix
 (b) $|AB| = 0$, then $A = 0$ or $B = 0$ or both A and B are null matrices.
 (c) If each of the three matrices of the same order are symmetric, then their sum is symmetric matrix.
 (d) If A and B are two matrices of the same order, then $A - B = B - A$.

16. Given that matrices A and B are of the order $3 \times n$ and $m \times 5$ respectively, then the order of the matrix $C = 5A + 3B$ is
 (a) 3×5 (b) 5×3 (c) 3×3 (d) 5×5

17. A linear programming problem (LPP) along with the graph of its constraints is shown below. The corresponding objective function is Minimize: $Z = 3x + 2y$. The minimum value of the objective function is obtained at the corner point $(2, 0)$.



- The optimal solution of the linear programming problem _____.
 (a) does not exist as the feasible region is unbounded.
 (b) does not exist as the inequality $3x + 2y < 6$ does not have any point in common with the feasible region.
 (c) exists as the inequality $3x + 2y > 6$ has infinitely many points in common with the feasible region.
 (d) exists as the inequality $3x + 2y < 6$ does not have any point in common with the feasible region.

18. Consider the objective function $Z = 40x + 50y$. The minimum number of constraints that are required to maximize Z is/are
 (a) 4 (b) 3 (c) 2 (d) 1

ASSERTION - REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason(R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true but R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) Both A and R are false.

19. **Assertion (A):** The relation $R = \{(x, y) : x + y \text{ is a prime number and } x, y \in N\}$ is not a reflexive relation.

Reason(R) : The number $2n$ is composite for all natural numbers n .

20. **Assertion (A):** The maximum of the function $f(x) = x^5, x \in [-1, 1]$ is attained at its critical point $x = 0$.
Reason(R) : The maximum of a function can only occur at the points where derivative is zero.

SECTION B

This section comprises of very short answer type questions (VSA) of 2 marks each.

21. Write the simplest form of $\tan^{-1} \left(\frac{\cos x}{1 + \sin x} \right)$

OR

$$\text{Prove that } \sec^2(\tan^{-1} 2) + \operatorname{cosec}^2(\cot^{-1} 3) = 15$$

22. Evaluate: $\int \frac{\cos x}{1 + \cos x} dx$. OR $\int \frac{1}{\sqrt{x^2 + 2x + 2}} dx$.

23. If $f(x) = |\tan 2x|$, then find the value of $f'(x)$ at $x = \frac{\pi}{3}$.

24. Show that all the diagonal elements of a skew symmetric matrix are zero.

25. The population of the rabbits in a forest is modelled by the function $P(t) = \frac{2000}{1 + e^{-0.5t}}$, where P represents the population of rabbits in t years. Determine whether the rabbit population is increasing or not, and justify your answer.

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each.)

26. Show that the function $f: R^* \rightarrow R^*$ defined by $f(x) = \frac{1}{x}$ is one-one and onto, where R^* is the set of all non-zero real numbers. Is the result true, if the domain R^* is replaced by N with co-domain being same as R^* .

27. A relation R on the set $A = \{1, 2, 3, 4, 5\}$ is defined as $R = \{(x, y) : |x^2 - y^2| < 8\}$. Check whether the relation R is reflexive, symmetric and transitive.

28. Examine the continuity of the function $f(x) = \begin{cases} \frac{e^{1/x}}{1+e^{1/x}}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ at $x = 0$.

OR

$$\text{If } \log \sqrt{x^2 + y^2} = \tan^{-1} \left(\frac{x}{y} \right), \text{ then show that } \frac{dy}{dx} = \frac{y-x}{y+x}.$$

29. Evaluate: $\int (x^2 + 1) \log x \, dx$
OR

Evaluate using properties of integration $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \frac{dx}{1 + \sqrt{\tan x}}$.

30. Solve the linear programming problem graphically : Minimize $Z = x + 2y$
subject to the constraints $x + 2y \geq 100$, $2x - y \leq 0$, $2x + y \leq 200$, $x, y \geq 0$.

31. Find the intervals in which the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is strictly increasing or decreasing.

OR

Find the absolute maximum and minimum values of $f(x) = (3x^2 - x^3)^{\frac{1}{3}}, x \in [-1, 1]$.

SECTION D

This section comprises of long answer type questions (LA) of 5 marks each.

32. $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then find the value of a and b .

33. Find the maximum area of an isosceles triangle inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with its vertex at one end of the major axis.

OR

If the function $f(x) = 2x^3 - 9mx^2 + 12m^2x + 1, m > 0$ attains its maximum and minimum at p and q respectively such that $p^2 = q$, then find the value of m .

34. Integrate: $\int_1^4 |x - 1| + |x - 2| + |x - 3| \, dx$

OR

$$\int \frac{1}{(x^2+1)(x^2+4)} \, dx$$

35. If $y = x \log \left(\frac{x}{a+bx} \right)$, then prove that $x^3 \frac{d^2y}{dx^2} = \left[x \frac{dy}{dx} - y \right]^2$.

SECTION E

(This section comprises of 3 case study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i),(ii),(iii) of marks 1,1,2 respectively. The third case study question has sub-parts of two marks each.)

36. $P(x) = -5x^2 + 125x + 37500$ is the total profit function of a company , where x is the production of the company.



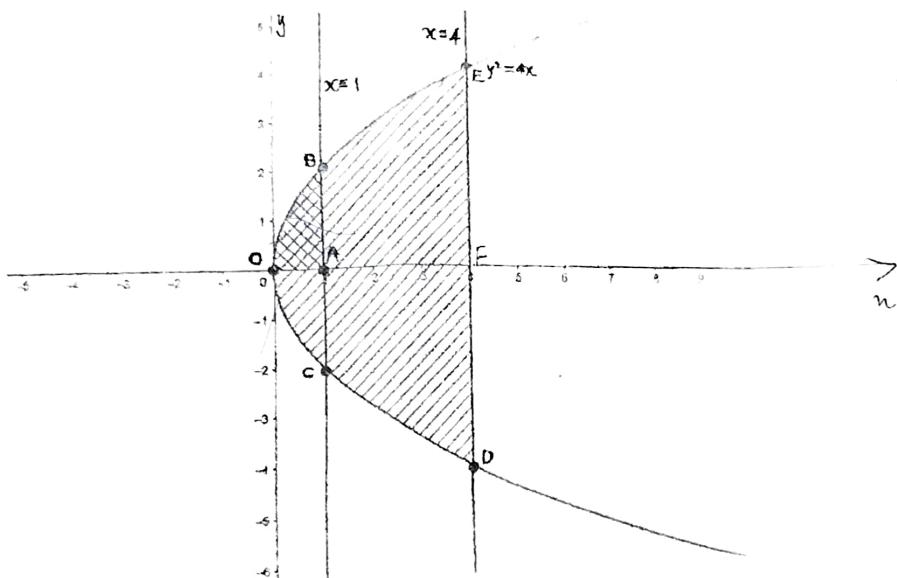
1. What will be the production when the profit is maximum?

2. What will be the maximum profit?

3. If the production is 2 units what will be the profit of the company?
 OR

What will be the production of the company when the profit is ₹38250?

37. Roshan a student of class 10, on his educational trip to Trivandrum got a chance to visit VSSC. He had decided to pursue his career in Astrophysics. He saw some interesting diagrams at the space centre which is given below.



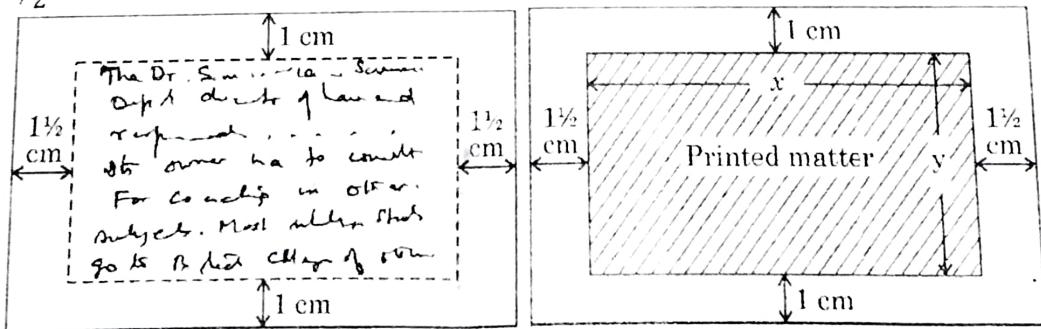
He identified the graph as $y^2 = 4x$. He also noted two straight lines $x = 1$ and $x = 4$. He had the following questions in his mind. Try to find the answer for his questions using integration.

1. Find the area of the region OABO.
2. Find the area of the shaded region in the first quadrant (OFEQ).
3. Find the ratio of the shaded region OABO and ODEO.

OR

Find the area of the shaded region BCDE.

38. A rectangular visiting card is to contain 24 sq. cm of printed matter. The margins at the top and bottom of the card are to be 1cm and the margins on the left and right are to be $1\frac{1}{2}$ cm as shown below:



On the basis of the above information, answer the following questions:

- (1) Write the expression for the area of the visiting card in terms of x .
- (2) Obtain the dimensions of the card of minimum area.



D.A.V. GROUP
COMMON QUARTERLY EXAMINATION - (2024 – 2025)
CHEMISTRY (043)

Class : XII
Date : 23.09.2024

Time : 3 Hours
Max. Marks : 70

General Instructions:

Read the following instructions carefully.

- There are 33 questions in this question paper with internal choice.
- SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
- SECTION B consists of 5 short answer questions carrying 2 marks each.
- SECTION C consists of 7 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case - based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- Use of log tables and calculators is not allowed.

SECTION- A

The following questions are multiple-choice questions with one correct answer. Each question carries 1mark. There is no internal choice in this section. (16 x 1 = 16)

- The correct order of osmotic pressure of 0.01M aqueous solution of the following is
 - Sucrose > CH₃COOH > KCl
 - CH₃COOH > Sucrose > KCl
 - Sucrose > KCl > CH₃COOH
 - KCl > CH₃COOH > Sucrose
- In a Leclanche dry cell, anode is
 - Graphite rod
 - FeO and Fe(OH)₂
 - Zinc container.
 - MnO₂ + C
- The limiting molar conductivities of NaCl, KBr, KCl are 126, 152 and 150 S cm² mol⁻¹ respectively, the Λ° for NaBr is
 - 278 S cm² mol⁻¹
 - 976 S cm² mol⁻¹
 - 128 S cm² mol⁻¹
 - 302 S cm² mol⁻¹
- The osmotic pressure of 0.2 molar solution of urea at 27°C (R=0.082 litre atm mol⁻¹ K⁻¹) is
 - 4.92 atm
 - 1 atm
 - 0.2 atm
 - 27 atm
- In the reaction, CrO₄²⁻ + X → Cr₂O₇²⁻, X is
 - OH⁻
 - H⁺
 - H₂O
 - O₂

6. Number of electrons transferred in each case when KMnO_4 acts as an oxidizing agent to give MnO_2 , Mn^{2+} , MnO_4^{2-} respectively are
(a) 3.5 and 1
(b) 1, 3 and 5
(c) 5, 1 and 3
(d) 3, 1 and 5
7. The number of possible geometrical isomers for the complex $[\text{Pt}(\text{NO}_2)(\text{py})(\text{NH}_2\text{OH})(\text{NH}_3)]$ is
(a) 2
(b) 4
(c) 3.
(d) 0
8. Which one of the following has highest molar conductivity?
(a) Diammine dichlorido platinum(II)
(b) Tetraammine dichlorido cobalt (III) chloride
(c) Hexaqua chromium (III) chloride
(d) Potassium hexacyano ferrate (II)
9. The major product formed when 2-bromo-2-methyl butane is refluxed with ethanolic KOH is
(a) 2-methyl but-2-ene
(b) 2-methyl butan-1-ol
(c) 2-methyl but-1-ene
(d) 3-methyl butan-2-ol
10. How many chiral compounds are possible on monochlorination of 2-methyl butane?
(a) 6
(b) 2
(c) 4
(d) 8
11. Which of the following compounds will be formed when methoxy benzene is reacted with HBr?
(a) Phenol and bromomethane
(b) Methanol and bromobenzene
(c) Phenol and methanol
(d) Bromobenzene and bromomethane
12. A carbonyl compound reacts with hydrogen cyanide to form cyanohydrin which on hydrolysis forms a racemic mixture of α -hydroxy acid. The carbonyl compound is
(a) acetone
(b) diethyl ketone
(c) formaldehyde
(d) acetaldehyde

The following questions 13 to 16 are Assertion and Reason type. Read assertion and Reason carefully and answer the question on the basis of following options. Select one option that best describes the statements.

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

13. **Assertion (A):** According to Kohlrausch law the molar conductivity of a strong electrolyte at infinite dilution is sum of molar conductivities of its ions.

Reason (R): The current carried by cation and anion is always equal.

14. **Assertion (A):** Linkage isomerism arises in coordination compounds containing ambidentate ligand.

Reason (R): Ambidentate ligand has two different donor atoms.

15. **Assertion (A):** It is difficult to replace chlorine by -OH in chlorobenzene in comparison to that in chloroethane.

Reason (R): Chlorine-carbon bond in chlorobenzene has a partial double bond character due to resonance.

16. **Assertion (A):** Aldehydes and ketones, both react with Tollen's reagent to form silver mirror.

Reason (R): Both aldehydes and ketones contain a carbonyl group.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each. (5 x 2 = 10)

17. (a). The dissolution of ammonium chloride in water is endothermic process. What is the effect of temperature on its solubility?

(b) State Raoult's law.

18. a) Why do tetrahedral complexes do not show geometrical isomerism?
b) Write the IUPAC name of $\text{Na}_3[\text{Cr}(\text{OH})_2\text{F}_4]$

(or)

What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand. Give an example for each type.

19. a) What is meant by the chelate effect?
b) What is the oxidation state of Iron in $[\text{Fe}(\text{CO})_5]$

20. (a) Arrange the following compounds in order of increasing boiling points.

Bromomethane, Bromoform, chloromethane, Dibromo methane

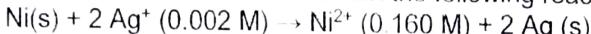
(b) p-Dichlorobenzene has higher melting point than o- and p- isomers. Discuss.

21. Write the mechanism of acid catalyzed hydration of ethene to ethanol.

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each. (7x3 = 21)

22. (a) Calculate the emf of the cell in which the following reaction takes place.



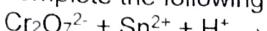
Given that $E^\circ_{\text{cell}} = 1.05 \text{ V}$. ($\log 4 = 0.6021$)

- (b). How much electricity in terms of Faraday is required to produce 20 g of Ca from molten CaCl_2 ? (Atomic mass of Ca = 40 g)

23. (a). Which is stronger reducing agent Cr^{2+} or Fe^{2+} and why?

- (b). Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why?

- (c). Complete the following equation:



24. Explain on the basis of Valence bond theory that $[\text{Ni}(\text{CN})_4]^{2-}$ ion with square planar structure is diamagnetic and the $[\text{NiCl}_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.

25. (a). A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 g of benzene has a boiling point of 80.31°C . Determine the molar mass of this compound. (Boiling point of pure benzene = 80.10°C and K_b for benzene = $2.53 \text{ }^\circ\text{C Kg mol}^{-1}$)

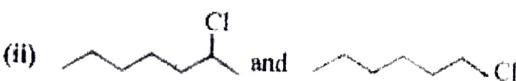
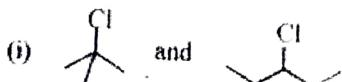
- (b). What will happen if pressure greater than osmotic pressure is applied on the solution separated by a semipermeable membrane from the solvent?

26. a) How will you obtain monobromo benzene from aniline?

- b) Convert: a) propene to 1-nitropropane
b) Ethanol to ethyl fluoride

(or)

- a) In the following pair of compounds, which compound undergoes faster $\text{S}_{\text{N}}1$ reaction?



- b) Write Fittig reaction.

27. a) Illustrate the following reactions giving a chemical equation for each.

- (i) Kolbe's reaction

- (ii) Williamson's synthesis of diethyl ether.

- b) Boiling point of ethanol is higher than methoxy methane, why?

28. How will you bring about the following conversions in not more than two steps?

- (a). Benzoic acid to benzaldehyde
(b). Benzene to m-Nitro acetophenone
(c). Propanone to propene

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow. (2 x 4 = 8)

29. The acidic nature of alcohols is due to the presence of polar O-H bond. Oxygen is more electronegative than hydrogen and therefore it withdraws the shared electron pair between O and H atoms towards itself. As a result, the O-H bond becomes weak and loses a proton (H^+). Therefore, alcohols behave as acids. However, alcohols are weak acids than water. This is

quite expected because of the electron releasing inductive effect of the alkyl group. The alkyl group releases electrons towards oxygen atom and increases electron density over the oxygen atom tending to decrease the polarity of O-H bond. As a result, the tendency of oxygen to withdraw electrons in O-H bond towards itself decreases and therefore, the release of H⁺ becomes difficult. On the other hand, there is no electron releasing group in water and the electron pair of O-H bond gets more attracted towards oxygen atom than in alcohol. Thus, the release of H⁺ from water is easier but slightly less in alcohol. Thus, alcohols are weaker acids than water.

Answer the following questions:

- a) Arrange the following in the decreasing order of acidic strength. (1+1+2)
CH₃OH, H₂O, (CH₃)₂CHOH
- b) Tertiary alcohols are less acidic than primary, secondary alcohols why?
- c) Predict which is stronger acid in each of the following pairs
(i) phenol or p-nitrophenol (ii) (CH₃)₂CHOH or (CF₃)₂CHOH

OR

Explain why ortho nitro-phenol is more acidic than o-methoxy phenol?

30. When a voltage is applied between the electrodes dipped into an electrolytic solution, ions of the electrolyte move and therefore electric current flows through the electrolytic solution. The power of electrolytes to conduct electric current is termed as conductance or conductivity. The conductance of an electrolyte depends on the number of ions present in the solution. The strong electrolytes dissociate almost completely into ions in solutions and therefore their solutions have high conductance. On the other hand, weak electrolytes, dissociate to only small extents and give lesser number of ions. Therefore, the solution of weak electrolytes have low conductance. The conductance of the electrolytic solution depends on nature of the solvent and its viscosity, size of ions produced and their solvation, concentration of the electrolytic solution and temperature.

Answer the following questions:

(1+1+2)

- a) A 0.01 M solution of MgCl₂ is diluted by adding water. What will happen to its conductivity and molar conductivity?
- b) Define limiting molar conductivity.
- c) The conductivity of 0.20 M KCl solution at 298 K is 0.025 S cm⁻¹. Calculate its molar conductivity.

OR

- a) Why is it not possible to determine Λ^0_m for weak electrolytes by extrapolation?
- b) What is the effect of temperature on the electrical conductance of
(i) metallic conductor (ii) electrolytic conductor?

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice: (3 x 5 = 15)

31. Attend any five of the following: (5x1=5)

- a) The second ionization enthalpies of chromium and manganese are 1592 and 1509 KJ/mol. Explain the higher ionization enthalpy value of chromium.
- b) Explain why Transition metals and their compounds are generally found to be good catalysts?
- c) Why the enthalpies of atomization of transition metals are quite high?
- d) Why the atomic radii of the metals of the 5d series of transition elements are virtually the same as those of the corresponding members of the 4d series?
- e) Give reason why MnO is basic while Mn₂O₇ is acidic.
- f) Write the ionic equation for reaction of KI with acidified KMnO₄.

g) Chromium is a typical hard metal while mercury is a liquid. Why?

32 (a) The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non volatile, non-electrolyte solid weighing 0.50 g is added to 39.0 g of benzene (molar mass 78 gmol⁻¹). The vapour pressure of the solution, then is 0.845 bar. What is the molar mass of the solid substance? (3)

(b) Molal elevation constant for benzene is 2.52 K/m. A solution of some organic substance in benzene boils at 0.126°C higher than benzene. What is the molality of the solution? (2)

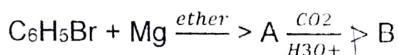
(OR)

(a) 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the Van't Hoff factor and predict the nature of solute (associated or dissociated). [Given: molar mass of benzoic acid = 122 gmol⁻¹, K_f for benzene = 4.9 K kg mol⁻¹] (3)

(b). Define Azeotropes. Give an example each for maximum boiling azeotropes and minimum boiling azeotropes. (2)

33 (a) Write the product of aldol condensation of acetaldehyde. (1)

(b) Complete the following reaction: (2)



(C) Give a chemical test to distinguish acetophenone and benzophenone and write the equation involved. (1)

(d) Predict the product: $\text{C}_6\text{H}_5\text{ClIO} + \text{NH}_2\text{OH} \rightarrow ?$

(OR)

(a) A ketone (A) which undergoes haloform reaction gives compound (B) on reduction with LiAlH₄. B on heating with con. H₂SO₄ gives compound (C). Compound C on ozonolysis followed by hydrolysis in the presence of Zn dust gives only acetaldehyde. Identify A, B and C. Write the reactions involved. (3)

(b) (i) Write HVZ reaction
(ii) What happens when acetone is reduced with Zn(Hg) in the presence of HCl?
