Botany - Section A

1.

The aquatic plant in which pollination is not carried out by water is:

1. *Vallisneria*

2. Water lily

3. *Zostera*

4. *Hydrilla*

2.

The embryo of a grass seed is enclosed by two protective sheaths, a(n) _____, which covers the young shoot, and a(n) _____, which covers the young root.
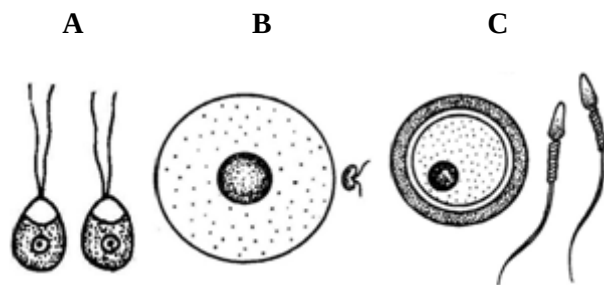
1. plumule; radical

2. hypocotyl; picotyls

3. coleoptile; coleorrhiza

4. scutellum; replum

3.

In a flowering plant, the pollen tube first arrives in

1. egg

2. an antipodal cell

3. a synergid

4. central cell

4.

A   B   C

Identify gametes (A, B and C) respectively:

1. Heterogametes, isogametes, Homogametes

2. Isogametes, homogametes, heterogametes

3. Homogametes, isogametes, heterogametes

4. Homo / Isogametes, heterogametes, heterogametes

5.

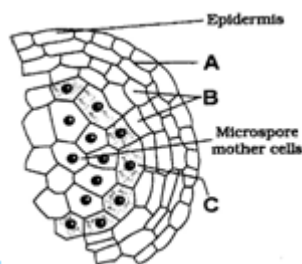A typical angiosperm bilobed and dithecous anther consists of how many theca?

1. Two

2. Four

3. Eight

4. Three

6.

In angiosperms, viability of pollen grains generally depend on

1. Pressure and humidity

2. Temperature and humidity

3. Plant type

4. Structure of pollen

7.

The above given diagram is an enlarged view of one microsporangium of a mature anther. Identify A, B and C

1. A - Middle layer, B - Endothecium, C – Tapetum

2. A - Endothecium, B - Tapetum, C - Middle layer

3. A - Endothecium, B - Middle layer, C – Tapetum

4. A - Tapetum, B - Middle layer, C - Endothecium

8.

Which of the following sequences of development of embryo sac / female gametophyte is correct?

1. Nucellus → Megaspore → Embryo sac

2. Nucellus → Megaspore mother cell → Megaspore → embryo sac

3. Nucellus → Megasporangium → Megaspore → Embryo sac

4. Nucellus → Megagametophyte → Megaspore → Embryo sac

9.

Match the column with respect to pollen grain:

	Column I		Column II
a)	Vegetative Cell Nucleus	(i)	Abundant Reserve Food & Irregular Nucleus
b)	Germ Pore	(ii)	Spindle shaped with dense cytoplasm
c)	Exine	(iii)	Where the Sporopollenin is absent
		(iv)	Variable Pattern & design
		(v)	Continuous layer made up of Cellulose & pectin

1. a(iv), b(v), c(iii)

2. a(i), b(iii), c(v)

3. a(i), b(iii), c(iv)

4. a(iv), b(i), c(iii)

10.

Look at the diagram given below and answer appropriately
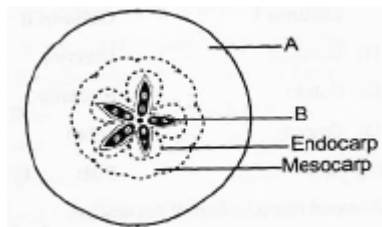
(i) Since ___A___ is associated with fruit, it is called as ___(i)___ .
(ii) Since ___B___ is present, fruit cannot be called as ___(ii)___ .

1. A - Pericarp, (i) - True fruits
2. B - Seed, (ii) - Ex-albuminous
3. A - Thalamus, (i) - True fruit
4. B - Seed, (ii) - Parthenocarpic

11.

Find correct match

Column I	Column II
a. Thick and swollen cotyledons	(i) Castor
b. Unused endosperm in mature seed	(ii) Legumes in
c. Unused nucleus in seed	(iii) Cashew nut
d. Thalamus contributes to fruit formation	(iv) Beet

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

12.

Vegetative phase in plants is same as _____ in animal.
1. Sexual phase
2. Juvenile phase
3. Reproductive phase
4. Syngamy phase

13.

Scientists are trying to transfer apomictic genes into hybrid varieties of several of our food and vegetable crops so that:

1. They get resistance against common pathogens

2. The yield of these plants can be increased many folds

3. Hybrid seeds need not be produced every year

4. Their germplasm is easily stored in labs for further research

14.

Find incorrect statement:

1. A polycarpellary, apocarpous gynoecium is found in *Michelia*

2. Many ovules are present in an ovary of papaya and orchids

3. Yellowish, powdery pollen grains found in *Hibiscus*

4. The more pistils may be fused together to form monocarpellary syncarpous gynoecium
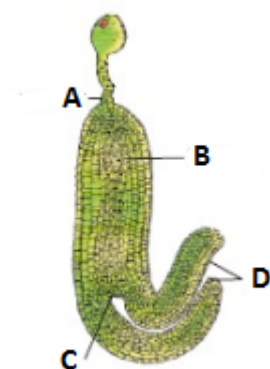
15.

The mature seeds of plants such as gram and peas, posses no endosperm, because

1. These plants are not angiosperms

2. There is no double fertilization in them

3. Endosperm is not formed in them

4. Endosperm gets used up by the developing embryo during seed development
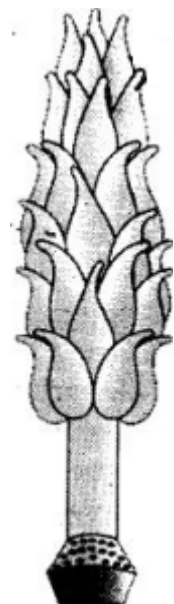
16.

What functions as the embryonic root of the plant?

1. A
2. B
3. C
4. D

17.

The following diagram shows:

1. Multicarpellary, syncarpus pistil of *Papaver*
2. Multicarpellary, apocarpus pistil of *Papaver*
3. Multicarpellary, apocarpus gynoecium of *Michelia*
4. Multicarpellary, syncarpus gynoecium of *Michelia*

18.

Mark the incorrect one

1. Pollen consumption has been claimed to increase the performance of athletes and race horses

2. Viability of pollen grain depends upon temperature, not humidity

3. Pollen grains of a large number of species can be stored in liquid nitrogen for years

4. pollen grains of rice and wheat lose viability within the half an hour

19.

Flowers of aquatic plants like water hyacinth and water lily

1. Are not pollinated by water

2. Emerge above the level of water for epihydrophily

3. Reach the surface of the water for hypohydrophily

4. Have exine in their pollen grains

20.

'Terror of Bengal' was introduced in India for its beautiful flowers and shape of leaves. It can grow vegetatively at a phenomenal rate through

1. Offset

2. Stolon

3. Sucker

4. Rhizome

21.

Viability of seeds

1. Maybe lost within a few months

2. Is 1000 years in *Lupinus arcticus*

3. Recorded in Phoenix is 10000 years

4. Can be tested by 0.1% solution of TTC

22.

Which one of the following group of plants do not show the clear cut distinction of vegetative, reproductive, and senescent phases?

1. Annuals

2. Monocarpic biennials

3. Perennials

4. More than one option is correct

23.

Read the following statements carefully and select the correct

a. Tapetum cells possess dense cytoplasm and generally have more than one nucleus

b. Sporopollenin is absent in the areas called germ pore

c. The generative cell is large, spindle-shaped with a irregularly shaped nuclei

d. The spindle of first mitosis in pollen is asymmetric

1. a, b, c, & d

2. a, b, & c

3. a, c, & d

4. a, b, & d

24.

Read the following statements

a. Free nuclear division in developing embryo sac.

b. Free nuclear division in PEN.

c. Formation of heterogametes in Fucus.

d. Chemotactic movement of sperms in Marchantia.

e. Germination of seed within fruit when fruit is still attached to mother plant.

How many of the above statements represent post-fertilization development?

1. Two

2. Three

3. Four

4. One

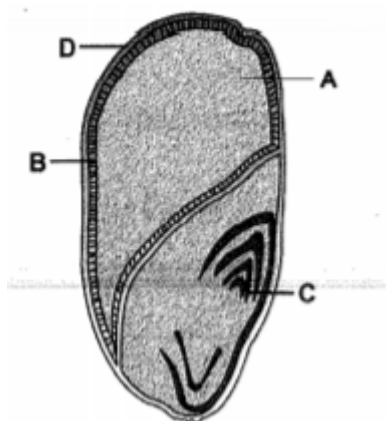25.

Identify the correct match

Column l		Column ll
1. Coleorhiza	-	Dicot family
2. Non-albuminous seed	-	Thick and swollen cotyledon
3. Residual nucellus	-	maize
4. Residual endosperm	-	Pea

26.

Identify the labels A, B, C and D in the figure given below

1. A - endosperm; B - scutellum; C - plumule; D - seed coat

2. A - aleurone; B - endosperm; C - radicle; D - coleorhiza

3. A - epithelium; B - aleurone; C - plumule; D - seed coat

4. A - endosperm; B - aleurone; C - plumule; D - seed coat and fruit wall

27.

Arrange the layers of anther wall from locus to periphery

1. Epidermis, middle layers, tapetum, endothecium
2. Tapetum, middle layers, epidermis, endothecium
3. Endothecium, epidermis, middle layers, tapetum
4. Tapetum, middle layers, endothecium, epidermis

28.

Assertion : Sporopollenin preserves pollen in fossil deposits
Reason : Sporopollenin is resistant to physical and biological decomposition

1. assertion is true; reason is false
2. assertion is false; reason is true
3. Both Assertion and reason are not true
4. Both Assertion and reason are true.

29.

Parthenocarpic fruits lack

1. Endocarp

2. Epicarp

3. Mesocarp

4. seed

30.

Which one of the following generates new genetic combinations leading to variations?

1. vegetative reproduction
2. parthenogenesis
3. Sexual reproduction
4. Nucellar polyembryony

31.

The arrangement of nuclei in a normal embryo sac in the dicot plant is

1. 2 + 4 + 2

2. 3 + 2 + 3

3. 2 + 3 + 3

4. 3 + 3 + 2

32.

The coconut water from tender coconut represents
1. endocarp
2. fleshy mesocarp
3. free nuclear proembryo
4. free nuclear endosperm

33.

Endosperm is formed during double fertilization by
1. two polar nuclei and one male gamete
2. one polar nuclei and one male gamete
3. ovum and male gametes
4. two polar nuclei and two male gametes

34.

Given below are a few statements related to external fertilization. Choose the correct statements:
i. The male and female gametes are formed and released simultaneously
ii. Only a few gametes are released into the medium
iii. Water is the medium in a majority of organisms exhibiting external fertilization
iv. Offspring formed as a result of external fertilization have better chance of survival than those formed inside the organism

1. iii and iv
2. i and iii
3. ii and iv
4. i and iv

35.

Which of the following groups of plants can reproduce through specialised asexual reproductive structure?

1. Algae and angiosperms

2. Angiosperms and gymnosperms

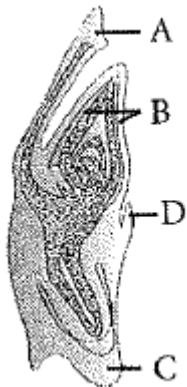3. Pteridophytes and fungi

4. Algae and fungi

Botany - Section B

36.

Unisexuality of flowers prevents

1. autogamy, but not geitonogamy

2. Both geitonogamy and xenogamy

3. geitonogamy, but not xenogammy

4. autogamy and geitonogamy

37.

Identify the parts labelled A, B, C and D in the given figure and select the correct option.

	A	B	C	D
1.	Scutellum	Epiblast	Coleoptile	Coleorhiza
2.	Scutellum	Coleorhiza	Coleoptile	Epiblast
3.	Scutellum	Coleoptile	Coleorhiza	Epiblast
4.	Epiblast	Coleoptile	Coleorhiza	Scutellum

38.

Match the following:

1	Sporogenous tissue	I	Process of formation of microspores from PMC by meiosis
2	Microspore tetrad	II	Microspores arranged in cluster of four cells
3	Microsporogenesis	III	Formation of microspore tetrad by meiosis
4	Tapetum	IV	Nourishes pollen grains

1. 1-III ; 2-I ; 3-II ; 4-IV

2. 1-III ; 2-II ; 3-I ; 4-IV

3. 1-II ; 2-III ; 3-I ; 4-IV

4. 1-II ; 2-III ; 3-IV ; 4-I

39.

I. No endosperm
II. Endosperm present
III. Cotyledons - thin
IV. Cotyledons – thick
V. Food is stored in cotyledons
VI. Food is stored in endosperms
Sort out correct points (from I to VI) for A (Albuminous) and B (Exalbuminous) seeds:

	A	B
1.	II, III, VI	I, IV, V
2.	I, IV, V	II, III, VI
3.	I, III, V	II, IV, VI
4.	II, IV, VI	I, III, V

40.

Arrange the following stages of microspore development into pollen grain, in the correct sequence
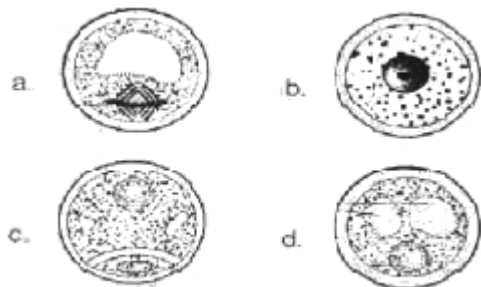
1. b, c, d, and a

2. b, d, a and c

3. a, c, b and d

4. b, a, d and c

41.

Both chasmogamous and cleistogamous flowers, are produced by

1. Pea and Zostera.

2. Bean and Vallisneria.

3. Maize and bamboo.

4. Oxalis and Commelina.

42.

Which one of the following is an incorrect statement with respect to life span of organisms?

1. Peepal tree has a much longer life span as compared to a mango tree

2. Life spans of organisms are not necessarily correlated with their size

3. Single-celled organism like Amoeba does not show natural death

4. It is correlated with the complexity and habit of plants

43.

Vegetative cell in a pollen grain

1. Floats in the cytoplasm of the generative cell

2. Is small and spindle-shaped

3. Is larger than generative cell but lacks reserve food

4. Has a large irregularly shaped nucleus

44.

Transfer of pollen grains from the anther of one flower to the stigma of another flower of the same plant is called as

1. Xenogamy

2. Autogamy

3. Geitonogamy

4. Cleistogamy

45.

Given below figure represents some structures of a green alga denoted as a and b. Identify these structures.
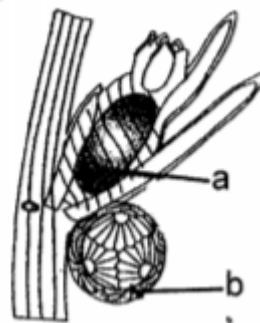
1. Both 'a' and 'b' are sex organs where 'a' is oogonium and 'b' is antheridium

2. Both 'a' and 'b' are sex organs where 'a' is antheridium and 'b' is oogonium

3. Both 'a' and 'b' are vegetative propagules known as bulbils

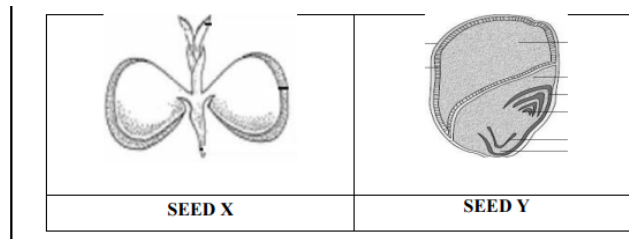4. Both 'a' and 'b' are non-jacketed sex organs present in Chara

46.

Find the incorrect statement w.r.t. asexual reproduction

1. Uniparental

2. With or without the involvement of gamete formation

3. Offsprings are the exact copy of their parent

4. Alternation of generation is observed

47.

Match the following

I) External fertilization   i) pollen grain
II) Androecium   ii)anther wall
III) Male gametophyte   iii)algae
IV) Primary parietal layer   iv)stamens

1. I-iv;II-i;III-ii;IV-iii
2. I-iii;II-iv;III-i;IV-ii
3. I-iii;II-iv;III-ii,IV-i
4. I-iii;II-i;III-iv;IV-ii

48.

Advantage of cleistogamy
1. Higher genetic variability
2. More vigorous offspring
3. No dependence on pollinators
4. Vivipary

49.

In a type of apomixes known as adventive polyembryony, embryo develops directly
from the

1. synergids or antipodals in an embryo sac
2. nucellus or integuments
3. zygote
4. accessory embryo sac in the ovule

50.

Which of the following statements are true related to Seed X and Y?

SEED X   SEED Y

(i) Seed X is dicot and endospermic or albuminous.
(ii) Seed X is dicot and non-endospermic or non-albuminous.
(iii) Seed Y is monocot and endospermic or albuminous.
(iv) Seed Y is monocot and non-endospermic or non-albuminous.
Choose the correct option with the respect to the nature of the seed
1. (i), (iii)
2. (ii), (iii)
3. (i), (iv)
4. (ii), (iv)

Zoology - Section A

51.

Ovaries are the primary sex organs in human females because they:

I. Produce the female gamete

II. Produce the hormone that regulates the development of secondary sexual characters

1. Both I and lI

2. OnlyI

3. Only II

4. None

52.

The final release of sperms from the seminiferous tubules is called:

1. Spermiation

2. Emission

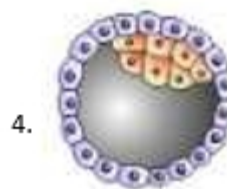3. Retrograde ejaculation

4. Ejaculation

53.

Lactational amenorrhea is effective up to maximum period of:

1. 3 months

2. 6 months

3. 9 months

4. 12 months

54.

What structure gets implanted on the wall on the uterus during embryonic development ?

55.

Menstrual flow occurs due to lack of

1. progesterone

2. FSH

3. oxytocin

4. vasopressin

56.

Which of the following contraceptive devices make uterus unsuitable for implantation?

1. Progestasert

2. CuT

3. Lippe's loop

4. Multiload

57.

I. Rapid decline in death rate.

II. Rapid increase in MMR and IMR

III. Rapid decline in MMR and IMR

IV. Increase in number of people in the reproductive age group

V. Rapid increase in the death rate

What are the causes of higher population growth?

1. All of the above

2. I, II, IV

3. I, III, IV

4. III, IV, V

58.

What does the slogan "Hum Do Hamare Do" aim at?

1. Raising of the marriageable age

2. Family Planning

3. Immunisation

4. Economic growth

59.

On which days of the menstrual cycle is ovulation expected?

1. 10th-30th

2. 1st-10th

3. 10th-17th

4. 18th-25th

60.

The low temperature required for spermatogenesis is maintained by

1. Location of testes outside abdominal cavity

2. Scrotum

3. Penis

4. More than one option

61.

Consider the following two statements:
I. The hymen is often torn during the first coitus.
II. The presence or absence of hymen is reliable indicator of virginity.
Of the two statements:
1. Both I and II are correct and II explains I
2. Both I and II are correct but II does not explain I
3. I is correct but II is incorrect
4. Both I and II are incorrect

62.

For normal fertility what percent of the sperm in ejaculate must exhibit normal morphology?

1. 20

2. 30

3. 40

4. 60

63.

Seminal plasma of humans is rich in

1. Fructose and certain enzymes, poor in Ca^{2+}.

2. Fructose, Ca^{2+} and certain enzymes.

3. Fructose, Ca^{2+} but no enzymes.

4. Glucose, certain enzymes but no Ca^{2+}.

64.
What is the correct sequence of sperm formation ?
1. spermatogonia, spermatocyte, spermatozoa, spermatid
2. Spermatogonia, spermatozoa, spermatocyte, spermatid
3. Spermatogonia, spermatocyte, spermatid, spermatozoa
4. Spermatid, spermatocyte, spermatogonia, spermatozoa

65.

The corpus luteum produces _____, which inhibits ovulation.

1. LH

2. FSH

3. Estrogen

4. Progesterone

66.

In the given diagram, the part of the female reproductive system that undergoes cyclical changes with changes in the secretion of gonadotropins and gonadal steroids during the menstrual cycle is represented by :
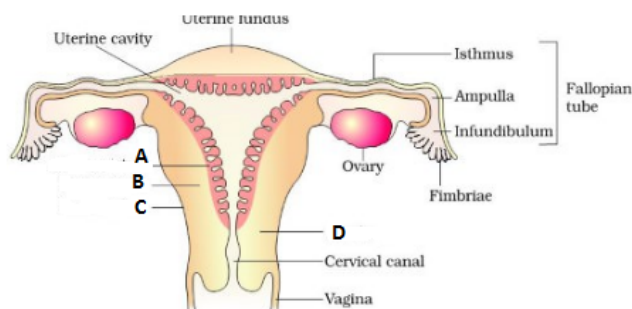
1. A

2. B

3. C

4. D

67.

How many seminiferous tubules will be there per testis?

1. 1 to 3

2. 500

3. 1000

4. At maximum, 4

68.

Which of the following is wrong?

1. Spermatogonia and leydig cells are present in seminiferous tubules

2. Small blood vessels are present along with Leydig cells

3. Leydig cells secrete Androgens

4. Sertoli cell provide nutrition to the germ cell.

69.

Which of the following pituitary hormones will have more amount on 29th day of standard menstrual cycle?

1. LH

2. FSH

3. Estrogen

4. Progesterone

70.

Which event surely leads to pregnancy

1. Unprotected coitus

2. Fertilization

3. Implantation

4. Gestation

71.

The mammary glands of female undergo differentiation

1. Just after parturition

2. During Gestation

3. After few hours of parturition

4. Puberty

72.

The primary oocyte completes the first meiotic division at the stage of:

1. Primordial follicle

2. Primary follicle

3. Secondary follicle

4. Tertiary follicle

73.

Following statements are given regarding MTP. Choose the correct options given below:

I. MTPs are generally advised during first trimester

II. MTPs are used as a contraceptive method

III. MTPs are always surgical

IV. MTPs require the assistance of qualified medical personnel

1. I and III

2. II and III

3. I and IV

4. I and II

74.

For which of the following is the number same in spermatogenesis and oogenesis?

1. lnterruptions in the meiotic division

2. Functional gametes produced by meiosis

3. Meiotic divisions required to produce each gamete

4. Gametes produced in a given period

75.

Select the correct statement regarding spermiogenesis

1. lnvolves transformation of spermatids into spermatozoa

2. lnvolves release of spermatozoa from seminiferous tubule into the lumen

3. lt is followed by meiosis ll that restores the haploid number of chromomes in spermatozoa

4. All of these

76.

Which of the following is correct regarding colostrum ?

1. Rich in antigens

2. Rich in antibodies

3. Produced upto 6 months (lactation period)

4 .lts release is blocked by low levels of prolactin

77.

Ovulation in the human female normally takes place during the menstrual cycle

1. At the mid secretory phase

2. At the end of proliferative phase

3. Just before the end of secretory phase

4. At the beginning of the proliferative phase

78.

The below diagram represents the ovum surrounded by few sperms.
Identify A, B, C and D :-
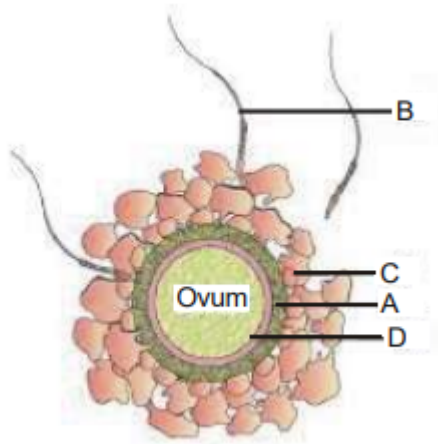
1. A-Zona pellucida, B-Sperm, C-Cells of the corona radiata, D-Perivitelline space

2. A-Cells of corona radiata, B-Sperm, C-Zona pellucida, D-Perivitelline space

3. A-Perivitelline space, B-Sperm, C-Zona pellucida, D-Cells of the corona radiata

4. A-Perivitelline space, B-Sperm, C-Cells of corona radiata, D-Zona pellucida

79.

Which of the following STDs are not curable?

1. Genital herpes, Hepatitis B, HIV infection

2. Chlamydiasis, Syphilis, Genital warts

3. HIV, Gonorrhoea, Trichomoniasis

4. Gonorrhoea, Trichomoniasis, Hepatitis B

80.

Veneral diseases can spread through:

(a) Using sterile needles

(b) Transfusion of blood from infected person

(c) Infected mother to foetus

(d) Kissing

(e) Inheritance

Choose the correct answer from the options given below.

1. (b) and (c) only

2. (a) and (c) only

3. (a), (b) and (c)

4. (b), (c) and (d)

81.

Which of the following secretes the hormone, relaxin, during the later phase of pregnancy?

1. Foetus

2. Uterus

3. Graafian follicle

4. Corpus luteum

82.

Read the following given statements and choose the correct option

Statement-A : All ART require extremely high precision handing by specialized professionals and expensive instrumentation.

Statement-B : Emotional, religious and social factors are also deterrents in the adoption of these methods

1. Both statements are incorrect

2. Both statements are correct

3. Only statement A is correct

4. Only statement B is correct

83.

Choose the incorrect option w.r.t. assisted reproductive technologies.

1. In IUT, embryos with upto 8 blastomeres are transferred into the uterus

2. In ZIFT, only zygote can be transferred into the fallopian tube

3. In AI, the semen collected either from husband or healthy donor is artificially introduced either into the vagina or into the uterus

4. During IVF, fertilization occur outside the body in almost similar conditions as that in the body

84.

The embryo at morula stage contains

1. 4 blastomeres

2. 30 blastomeres

3. 32 to 64 blastomeres

4. 8 to 16 blastomeres

85.

_____ protects the user from contracting STIs and AIDS.

Fill the blank with a suitable option

1. Tubectomy

2. Condom

3. Progestasert

4. Withdrawal method

Zoology - Section B

86.

Each Ovary is connected to the pelvic wall and the uterus by:

1. Peritoneum

2. Adipose tissue

3. Ligaments

4. Areolar tissue

87.

The function of male sex accessory ducts and glands are maintained by:

1. Hypothalamic releasing hormone

2. Pitutary gonadotropins

3. Adrenal cortex steroids

4. Testicular androgens

88.

The number of spermatozoa, a single primary spermatocyte ultimately produces in spermatogenesis, is

1. Eight

2. Four

3. Two

4. One

89.

Which of the following is incorrect regarding vasectomy?

1. No sperm occurs in seminal fluid

2. No sperm occurs in epididymis

3. Vasa deferentia is cut and tied

4. Irreversible sterility

90.

Signals for parturition originate from

1. both placenta as well as fully developed foetus

2. oxytocin released from maternal pituitary

3. placenta only

4. fully developed foetus only

91.

What is the approximate world population according to the recent census? (May 2000):

1. About 6 billion

2. About 60 billion

3. About 16 billion

4. About 6 million

92.

What is true for "Lactational amenorrhoea"?

I. It means absence of menstruation

II. Ovulation does not occur during the lactational period

III. Chances of failure of contraception are almost nil upto six months following parturition

IV. Side effects are almost nil

V. Contraceptive efficiency reduces after the period of intense lactation

VI. It is a natural method of contraception

VII. It increases phagocytosis of sperms

1. II, III, IV, V, VI

2. All except VII

3. II, III, IV, V

4. All of the above

93.

During pregnancy:

1. All events of menstrual cycle stop and there is no menstruation

2. Events of menstrual cycle continue but there is no menstruation

3. Events of menstrual cycle continue but there is menstruation only in the first trimester

4. All events of menstrual cycle stop and there is menstruation only in the first trimester

94.

Trace the path of physiologically mature sperm in the male reproductive tract

1. Seminiferous tubules→Rete testis→Vasa efferentia →Epididymis→Vas deferens→Ejaculatory duct→ urethra

2. Vas deferens→Epididymis→Ejaculatory duct→ Urethra

3. Rete testis→Epididymis→Vasa efferentia→Vas deferens→Ejaculatory duct→urethra

4. Epididymis→Ejaculatory duct→Vas deference→ Urethra

95.

Sperm motility is facilitated by

1. Middle piece

2. Neck

3. Tail

4. Acrosomal enzymes

96.

During the follicular phase of the menstrual cycle which of the following occur?
I. The primary follicle grows and becomes fully mature Graafian follicle
II. The endometrium of the uterus regenerates through proliferation
1. Only I
2. Only II
3. I and II
4. None

97.

MTPs are considered relatively safe during the _____ trimester; _____ trimester abortions are much riskier:

1. First, second

2. Second, first

3. Third, first

4. Third, second

98.

Which of the following is/are related to STDs?

1. Infertility

2. Still birth

3. Pelvic inflammatory disease

4. All of the above

99.

Select the option which correctly states the given statements as true (T) or false (F).

a. Each human testis has about 250 seminiferous tubules.

b. Fimbriae help in the collection of the ovum.

c. The human male ejaculates about 200 to 300 million sperms per coitus.

d. Blockage of vas deferens would prevent the incorporation of sperms in ejaculate

   a b c d

1. T T T T

2. F F T T

3. F T T T

4. T F T T

100.

Select the correct statement w.r.t. figure given below
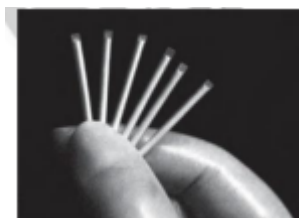
1. It is a sterilization method of contraception

2. Mode of action is similar to that of contraceptive pills and their effective period is much longer

3. Irreversible method of contraception

4. One of the most widely accepted methods of contraception in India

Chemistry - Section A

101.
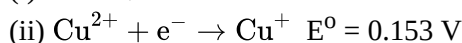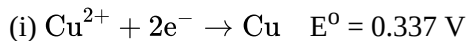
Given,
(i) $Cu^{2+} + 2e^- \rightarrow Cu$ E^o = 0.337 V
(ii) $Cu^{2+} + e^- \rightarrow Cu^+$ E^o = 0.153 V
Electrode potential, E^0 for the reaction,
$Cu^+ + e^- \rightarrow Cu$, will be :
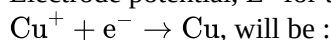
1. 0.52 V

2. 0.90 V

3. 0.30 V

4. 0.38 V

102.
Standard free energies of formation(in kJ/mol) at 298 K are -237.2, -394.4 and -8.2 for $H_2O(l)$, $CO_2(g)$ and pentane (g), respectively. The value of E_{cell} for the pentane-oxygen fuel cell is

1. 1.968 V

2. 2.0968 V

3. 1.0968 V

4. 0.0968 V

103.
In producing chlorine through electrolysis 100 W power at 125 V is being consumed. Liberation of chlorine per min is -
(ECE of chlorine is 0.367×10^{-6} kg/C)
1. 17.6 mg
2. 21.3 mg
3. 24.3 mg
4. 13.6 mg

104.

Total vapour pressure of mixture of 1 mol X $(P_x^a = 150 \text{ torr})$ and 2 mol Y $(P_Y^a = 300 \text{ torr})$ is 240 torr. In this case -

1. There is a negative deviation from Raoult's law

2. There is a positive deviation from Raoult's law

3. There is no deviation from Raoult's law

4. Can not be decided

105.

Which of the following is not the characteristic of ionic solids?

1. Very low value of electrical conductivity in the molten state

2. Brittle nature

3. Very strong forces of interactions

4. Anisotropic nature

106.

The percentage of empty space in a body centred cubic arrangement is ....

1. 74

2. 68

3. 32

4. 26

107.

Henry's law constant for the solution of methane in benzene at 298 K is 4.27×10^5 mm Hg. The mole fraction of methane in benzene at 298 K under 760 mm Hg will be -

1. 1.85 x 10^{-5}

2. 192 x 10^{-4}

3. 178 x 10^{-5}

4. 18.7 x 10^{-5}

108.

Element 'B' forms ccp structure and 'A' occupies half of the octahedral voids, while oxygen atoms occupy all the tetrahedral voids. The structure of bimetallic oxide is -
1. A_2BO_4
2. A_4B_2O
3. AB_2O_4
4. A_2B_2O

109.

For the reaction $2A + B \rightarrow C$, the values of initial rate at different reactant concentrations are given in the table below. The rate law for the reaction is :

[A] (mol L^{-1})	[B] (mol L^{-1})	Initial Rate (mol L^{-1}s^{-1})
0.05	0.05	0.045
0.10	0.05	0.090
0.20	0.10	0.72

1. Rate = k[A] [B]
2. Rate = k [A] $[B]^2$
3. Rate =$K [A]^2 [B]^2$
4. Rate = $K [A]^2 [B]$

110.

1 g of a non-volatile non-electrolyte solute is dissolved in 100 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 5. The ratio of the elevation in their boiling points, $\frac{\Delta T_b(A)}{\Delta T_b(B)}$, is:

1. 5:1

2. 1:2

3. 10:1

4. 1:5

111.

A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using 0.1 Faraday electricity. The number of mole of Ni will be deposited at the cathode is-
1. 0.10
2. 0.05
3. 0.20
4. 0.15

112.

The standard Gibbs energy for the given cell reaction in kJ mol^{-1} at 298 K is :
$$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$$
E^o(cell) = 2V at 298 K
(Faraday's constant, F = 96000 C mol^{-1})
1. -192 kJ mol^{-1}
2. 192 kJ mol^{-1}
3. -384 kJ mol^{-1}
4. 384 kJ mol^{-1}
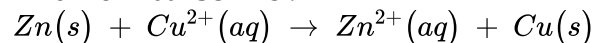
113.

The decreasing order of electrical conductivity of the following aqueous solutions is :
0.1 M Formic acid (A),
0.1 M Acetic acid (B),
0.1 M Benzoic acid (C)

1. A > B > C

2. A > C > B

3. C > B > A

4. C > A > B

114.

NO_2 required for a reaction is produced by the decomposition of N_2O_5 in CCl_4 as per the equation,

$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$.
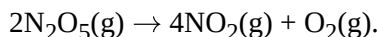
The initial concentration of N_2O_5 is 3.00 mol L^{-1} and it is 2.75 mol L^{-1} after 30 minutes. The rate of formation of NO_2 is :

1. 2.083×10^{-3} mol L^{-1} min^{-1}

2. 8.333×10^{-3} mol L^{-1} min^{-1}

3. 4.167×10^{-3} mol L^{-1} min^{-1}

4. 1.667×10^{-2} mol L^{-1} min^{-1}

115.

Given
$$CO^{3+} + e^- \rightarrow CO^{2+} ; E^\circ = +1.81\ V$$
$$Pb^{4+} + 2e^- \rightarrow Pb^{2+} ; E^\circ = +1.67\ V$$
$$Ce^{4+} + e^- \rightarrow Ce^{3+} ; E^\circ = +1.61\ V$$
$$Bi^{3+} + 3e^- \rightarrow Bi ; E^\circ = +0.20\ V$$
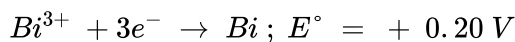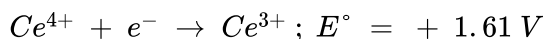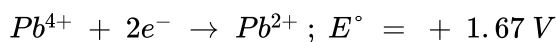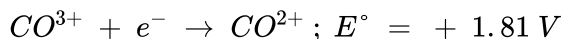
Oxidizing power of the species will increase in the order:

1. $Co^{3+} < Ce^{4+} < Bi^{3+} < Pb^{4+}$

2. $Co^{3+} < Pb^{4+} < Ce^{4+} < Bi^{3+}$

3. $Ce^{4+} < Pb^{4+} < Bi^{3+} < Co^{3+}$

4. $Bi^{3+} < Ce^{4+} < Pb^{4+} < Co^{3+}$

116.

For the reaction $2A + 3B + \frac{3}{2}C \rightarrow 3P$, The correct statement is-

1. $\frac{dn_A}{dt} = \frac{2}{3}\frac{dn_B}{dt} = \frac{3}{4}\frac{dn_C}{dt}$

2. $\frac{dn_A}{dt} = \frac{3}{2}\frac{dn_B}{dt} = \frac{3}{4}\frac{dn_C}{dt}$

3. $\frac{dn_A}{dt} = \frac{dn_B}{dt} = \frac{dn_C}{dt}$

4. $\frac{dn_A}{dt} = \frac{2}{3}\frac{dn_B}{dt} = \frac{4}{3}\frac{dn_C}{dt}$

117.

If 250 cm^3 of an aqueous solution containing 0.73 g of a protein A is isotonic with one litre of another aqueous solution containing 1.66 g of a protein B at 298 K, the ratio of the molecular masses of A and B is-

1. 1.54

2. 1.77

3. 1.65

4. 1.60

118.

A diatomic molecule X$_2$ has a body-centred cubic (bcc) structure with a cell edge of 300 pm. The density of the molecule is 6.17 g cm^{-3} . The number of molecules present in 200 g of X$_2$ is-

(Avogadro constant (N$_A$) = 6 × 10^{23} mol^{-1})

1. 8 N$_A$
2. 40 N$_A$
3. 4 N$_A$
4. 2 N$_A$

119.

The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the given figure
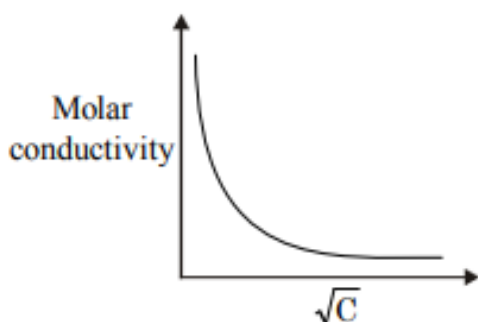
The electrolyte X is -

1. CH$_3$COOH
2. KNO$_3$
3. HCl
4. NaCl

120.

The type of 'defect' has the presence of cations in the interstitials sites is-

1. Schottky defect

2. Frenkel defect

3. Vacancy defect

4. Metal deficiency defect

121.

For 1 molal aqueous solution of the following compounds, which one will show the highest freezing point ?

1. [Co(H$_2$O)$_6$]Cl$_3$

2. [Co(H$_2$O)$_5$Cl]Cl$_2$.H$_2$O

3. [Co(H$_2$O)$_4$Cl$_2$]Cl.2H$_2$O

4. [Co(H$_2$O)$_3$Cl$_3$].3H$_2$O

122.

C$_6$H$_6$ freezes at 5.5°C. The temperature at which a solution 10 g of C$_4$H$_{10}$ in 200 g of
C$_6$H$_6$ freeze is- °C. (The molal freezing point depression constant of C$_6$H$_6$ is 5.12°C/m.)

1. 2 °C

2. 1 °C

3. 6 °C

4. 5 °C

123.

A set of solutions is prepared using 180 g of water as a solvent and 10 g of different non-volatile solutes A, B and C. The relative lowering of vapour pressure in the presence of these solutes are in the order-

[Given, molar mass of A = 100 g mol^{-1}; B = 200 g mol^{-1}; C = 10,000 g mol^{-1}]

1. A > B > C

2. A > C > B

3. C > B > A

4. B > C > A

124.

1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionised. The boiling point of the solution at 1 atm is-. (Rounded-off to the nearest integer) [Given K_b for (H_2O) = 0.52 K kg mol^{-1}]

1. 373 K

2. 380 K

3. 375 K

4. 377 K

125.

For the reaction, $aA + bB \rightarrow cC + dD$ the plot of log k vs $\frac{1}{T}$ is given below :
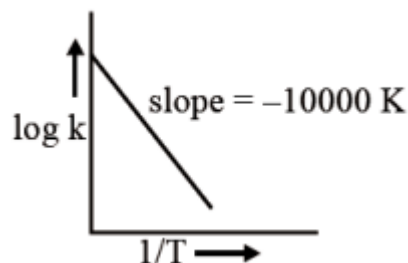
The temperature(K) at which the rate constant of the reaction is $10^{-4}s^{-1}$?

(Rounded-off to the nearest integer)

[Given: The rate constant of the reaction is 10^{-5} s^{-1} at 500 K.]

1. 546 K

2. 536 K

3. 516 K

4. 526 K

126.

Consider separate solutions of 0.500M C_2H_5OH(aq), 0.100 M $Mg_3(PO_4)_2$(aq), 0.250 M KBr(aq) and 0.125M Na_3PO_4(aq) at 25ºC. The correct statement about these solutions, assuming all salts to be strong electrolytes is-

1. 0.100 M $Mg_3(PO_4)_2$(aq) has the highest osmotic pressure

2. 0.125 M Na_3PO_4(aq) has the highest osmotic pressure

3. 0.500 M C_2H_5OH(aq) has the highest osmotic pressure.

4. They all have the same osmotic pressure

127.

Sodium metal crystallizes in a body centred cubic lattice with a unit cell edge of 4.29 Å. The radius of sodium atom is approximately-

1. 1.86 Å

2. 3.22 Å

3. 5.72 Å

4. 0.93 Å

128.

The reduction potential of hydrogen half-cell will be negative if :

1. $P(H_2)$ = 1atm and $[H^+]$ = 2.0 M

2. $p(H_2)$ = 1 atm and $[H^+]$ = 1.0 M

3. $p(H_2)$ = 2 atm and $[H^+]$ = 1.0 M

4. $p(H_2)$ = 2 atm and $[H^+]$ = 2.0 M

129.

The time for the half-life period of a certain reaction A → Products is 1 hour. When the initial concentration of the reactant 'A', is 2.0 mol L^{-1}, The time taken for its concentration to come from 0.50 to 0.25 mol L^{-1} if it is a zero-order reaction is-

1. 1h

2. 4 h

3. 0.5 h

4. 0.25 h

130.

18 g glucose ($C_6H_{12}O_6$) is added to 178.2 g water. The vapour pressure of aqueous solution in torr is-

1. 7.6
2. 752.4
3. 76.0
4. 780.0

131.

The metallic as well as ferromagnetic compound among the following is-

1. TiO_2
2. CrO_2
3. VO_2
4. MnO_2

132.

Consider the reaction, $2A + B \rightarrow$ Products. When concentration of B alone was doubled, the half life did not change. When the concentration of A alone was doubled, the rate increased by two times. The unit of rate constant for this reaction is –

1. $L\ mol^{-1}\ s^{-1}$

2. no unit

3. $mol\ L^{-1}s^{-1}$

4. s^{-1}

133.

A reaction was found to be second order with respect to the concentration of carbon monoxide. If the concentration of carbon monoxide is doubled, with everything else kept the same, the rate of reaction will :

1. Remain unchanged

2. Triple

3. Increases by a factor of 4

4. Double

134.

Half -life of a substance A following first order kinetics in 5 days. Starting with 100g of A, amount left after 15 days :

1. 25 g

2. 50 g

3. 12.5 g

4. 6.25 g

135.

H_2 gas is absorbed on the metal surface like tungsten. This follows _____ order reaction

1. Third

2. Second

3. Zero

4. First

Chemistry - Section B

136.

The correct statements, among the following about metals are-

I. Valence band overlaps with conduction band.

II. The gap between the valence band and conduction band is negligible

III. The gap between the valence band and conduction band cannot be determined

IV. Valence band may remain partially filled

1. (I, II, III)

2. (II, III, IV)

3. (I, III, IV)

4. (I, II, IV)

137.

The number of tetrahedral voids per unit cell in NaCl crystal is -

I. 4

II. 8

III. Twice the number of octahedral voids

IV. Four times the number of octahedral voids.

The correct choice among the given is-

1. (I, II)

2. (II, III)

3. (III, IV)

4. (I, IV)

138.

Assertion: Λ_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted.

Reason: For weak electrolytes degree of dissociation increases with a dilution of solution.

1. Both assertion and reason are true and the reason is the correct explanation of assertion.

2. Both assertion and reason are true and the reason is not the correct explanation of assertion.

3. Assertion is true but the reason is false.

4. Both assertion and reason are false.

139.

The graphs that represent a zero-order reaction are
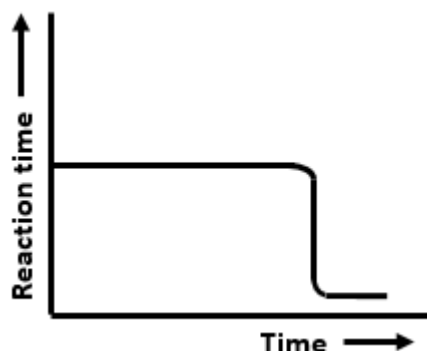
(a)
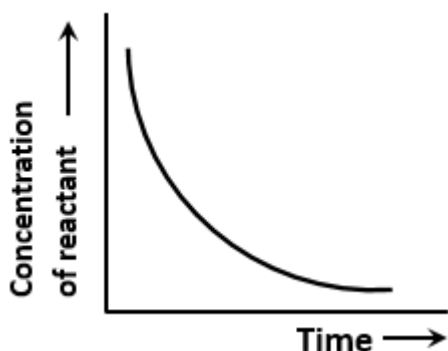
(b)
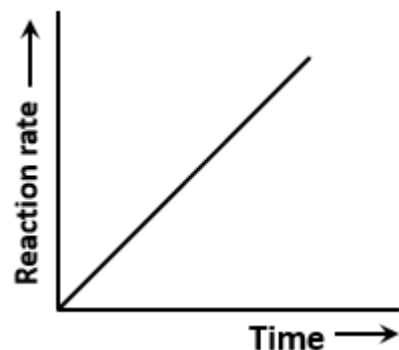
(c)
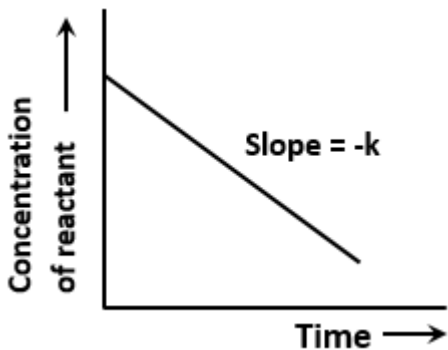
(d)

1. (a, b)
2. (b, c)
3. (c, d)
4. (a, d)

140.

Match the statements given in Column I and Column II :

Column I

A. Catalyst alters the rate of reaction

B. $e^{-E_a/RT}$

C. Energetically favorable reactions are sometimes slow

D. Area under the Maxwell-Boltzmann curve is constant

Column II

1. Proper orientation is not there always

2. By 'lowering the activation energy

3. Total probability is one

4. Refers to the fraction of molecules with energy equal tö or greater than the activation energy

Codes

	A	B	C	D
1.	2	4	1	3
2.	3	1	4	2
3.	1	4	3	2
4.	3	4	1	2

141.

When 12.2 g of benzoic acid is dissolved in 100 g of water, the freezing point of the solution was found to be –0.93°C ($K_f(H_2O)$ = 1.86K kg mol^{-1}). The number(n) of benzoic acid molecules associated (assuming 100% association) is -

1. 3

2. 1

3. 2

4. 5

142.

A reactant (A) forms two products :

$A \xrightarrow{k_1} B$, Activation Energy Ea_1

$A \xrightarrow{k_2} B$, Activation Energy Ea_2

If $Ea_2 = 2 Ea_1$, then k_1 and k_2 are related as :

1. $k_2 = k_1 e^{Ea_1 / RT}$

2. $k_2 = k_1 e^{Ea_2 / RT}$

3. $k_1 = k_2 e^{Ea_1 / R T}$

4. $k_1 = 2k_2 e^{Ea_2 / KT}$

143.

A non-ideal solution was prepared by mixing 30 mL chloroform and 50 mL acetone. The volume of mixture will be

1. >80 mL

2. <80 mL

3. =80 mL

4. ≥80 mL

144.

The unit cell with crystallographic dimensions $a \neq b \neq c$; $\alpha = \beta = \gamma = 90°$ is :

1. Cubic

2. Tetragonal

3. Orthorhombic

4. Hexagonal

145.

Solid CO_2 is an example of :

1. Molecular crystal

2. Covalent crystal

3. Metallic crystal

4. Ionic crystal

146.

Solution A contains 7 g/L of $MgCl_2$ and solution B contains 7 g/L of NaCl. At room temperature, the osmotic pressure of -

1. Solution A is greater than B

2. Both have same osmotic pressure

3. Solution B is greater than A

4. Cannot be determine

147.

The molality of a urea solution in which 0.0100 g of urea, [$CO(NH_2)_2$] is added to 0.3000 dm^3 of water at STP is-

1. 0.555m

2. 5.55×10^{-4} m

3. 33.3m

4. 3.33×10^{-2} m

148.

The potential of the cell containing two hydrogen electrodes as given below is-

Pt; $\frac{1}{2} H_2(g) | H^+ (10^{-8} M) | H^+ (0.001 M) | \frac{1}{2} H_2(g) Pt$

1. - 0.295 V

2. - 0.0591 V

3. 0.295 V

4. 0.0591 V

149.

The number of electrons passing per second through a cross-section of Cu wire carrying 10 ampere is :

1. 1×10^{19}

2. 8×10^{19}

3. 6×10^{19}

4. 1.6×10^{19}

150.

The elementary step of the reaction, $2\mathrm{Na} + \mathrm{Cl}_2 = 2\mathrm{NaCl}$ is found to follow III order kinetics, its molecularity is:

1. 1

2. 2

3. 3

4. 4

Physics - Section A

151. Which of these is not the property of a charged conductor in electrostatic conditions?

1. Body of metal is equipotential
2. Field lines are perpendicular to the metal surface
3. Electrostatic potential inside a metal body is zero
4. Electrostatic field inside metal is zero

152. Statement I: Point charges q_1 and q_2 produce electric field of magnitude E_1 and E_2 at any point and potential V_1 and V_2 at the same point. The electric field due to both the charges at that point must be $E_1 + E_2$.

Statement II: The electric potential at that point due to both the charges must be $V_1 + V_2$.

1. If both statement - I and statement - II are true but statement - II is not the correct explanation of statement - I
2. If both statement - I and statement - II are true, and statement - II is the correct explanation of statement - I
3. If statement - I is true but statement - II is false.
4. If statement - I is false but statement - II is true

153. In the given circuit, if point C is connected to the Earth and a potential of +2000 V is given to the point A, then potential at B is (assume circuit is complete)
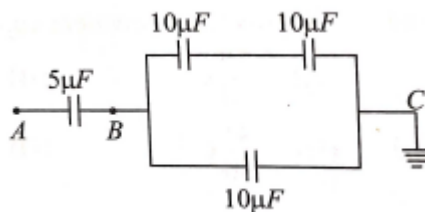
1. 1500 V
2. 1000 V
3. 500 V
4. 400 V

154. A particle of mass 0.002 kg and a charge 1 μC is held at rest on a frictionless horizontal surface at a distance of 1 m from a fixed charge of 1 mc. If the particle is released, it will be repelled. The speed of the particle when it is at a distance of 10 m from the fixed charge will be:

1. 60 ms^{-1}
2. 75 ms^{-1}
3. 90 ms^{-1}
4. 100 ms^{-1}

155. Two equally charged soap bubbles of equal volume are joined together to form a larger bubble. If each has a potential V, the potential of the resultant bubble is:
1. V
2. 2V
3. $2^{2/3}$ V
4. $2^{-1/3}$ V

156. If a soap bubble A is given a negative charge -q and another identical soap bubble B is given a positive charge +q, then
1. radius of A increases and that of B decreases
2. radius of B decreases and that of A increases
3. radius of both will decrease
4. radius of both will increase

157. What is the direction of electric field at point O as shown in figure?
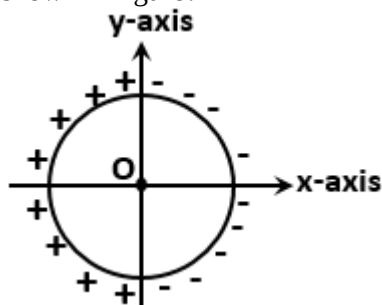
1. positive x-axis
2. negative x-axis
3. positive y-axis
4. negative y-axis

158. For the circuit shown, find the potential difference between A and B
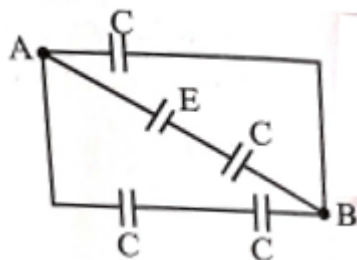
1. E
2. $\frac{2E}{3}$
3. $\frac{2E}{5}$
4. zero

159. Four charges of 6 μC, 2μC, -12 μC and 4 μC are placed at the corners of square of side 1 m. The square is in x-y plane and its center at its origin. Electric potential due to these charges is zero everywhere on the line
1. x = y, z = 0
2. x = 0 = z
3. x = 0 = y
4. x = z, y = 0

160. A number of capacitors each of capacitance 1 μF and each one of which get punctured if a potential difference just exceeding 500 volt is applied, are provided. Then an arrangement suitable for giving a capacitor of 2 μF across which 3000 volt may be applied requires at least
1. 18 component capacitors
2. 36 component capacitors
3. 72 component capacitors
4. 144 component capacitors

161. A point charge q is placed at a distance 2r from the centre O of a conducting uncharged sphere of radius r. Potential of induced charges at point P(lying on the line joining the point charge and centre of sphere) is
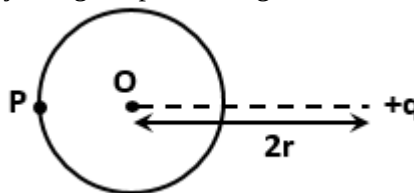
1. $\frac{Kq}{2r}$
2. $\frac{Kq}{3r}$
3. $\frac{Kq}{6r}$
4. zero

162. When switch is closed, charges on C_1 and C_2 are
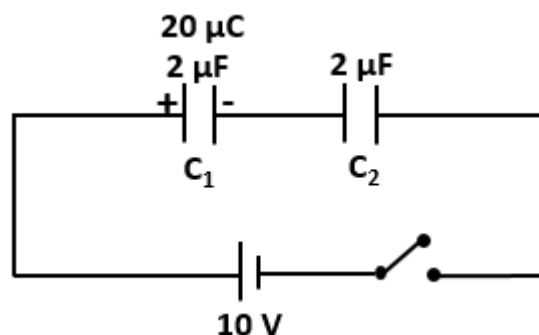
1. 20 μC, 0
2. 10 μC, 10μC
3. 30μC, 10μC
4. 0, 20μC

163. Two identical conducting spheres having unequal positive charges q_1 and q_2 separated by distance d. If they are made to touch each other and then separated again to the same distance, the electrostatic force between them, in this case, will be:
1. Less than before
2. Same as before
3. More than before
4. Zero

164. A large metallic plate is given a charge Q. Area of one face of the plate is A. Electric field at a point near the metallic plate is
1. $\frac{Q}{A\varepsilon_0}$
2. $\frac{Q}{2A\varepsilon_0}$
3. $\frac{Q}{4A\varepsilon_0}$
4. $\frac{2Q}{A\varepsilon_0}$

165. The capacitance of a parallel plate capacitor is C_a (figure a). A dielectric of dielectric constant K is inserted as shown in figure (B) and figure(C). If C_b and C_c denote the capacitance in figure (B) and (C), then
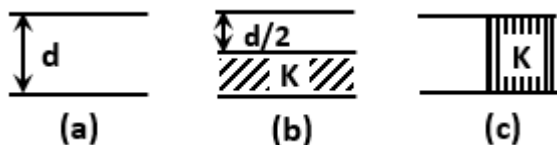

1. both C_b, $C_c > C_a$
2. $C_c > C_a$ while $C_b < C_a$
3. both C_b, $C_c < C_a$
4. $C_a = C_b = C_c$

166. A terminal voltage of a battery is
1. always equal to its emf
2. always greater than its emf
3. greater or less than its emf depending on the direction of the current through the battery.
4. greater or less than its emf depending on the magnitude of its internal resistance.

167. Potentiometer wire is 50 cm long. When AD = 20 cm no deflection occurs in the galvanometer. Then the resistance R will be:

1. 8 Ω
2. 12 Ω
3. 16 Ω
4. 24 Ω
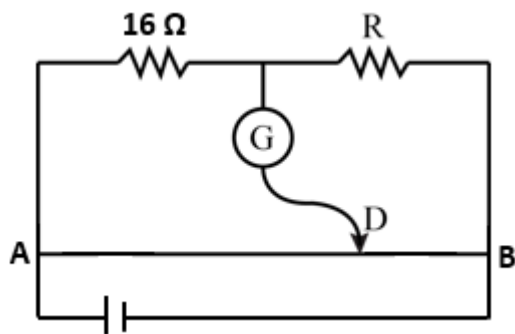
168. A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated now will be-
1. four times
2. doubled
3. halved
4. one-fourth

169. Four resistors are connected in a square formation. Two batteries of emf, E, and 2E are connected along the diagonals as shown in the figure. The current flowing in the resistor R_1 is ($R_1 = R$):
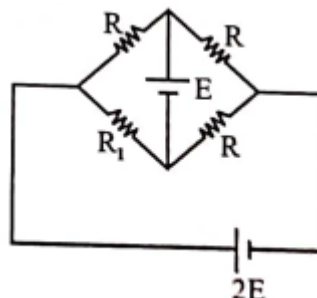
1. $\frac{4E}{3R}$
2. $\frac{E}{R}$
3. $\frac{3E}{2R}$
4. $\frac{3E}{R}$

170. Potential difference between points A and B is-

1. 122 volt
2. 60 volt
3. 100 volt
4. 30 volt

171. Potential of point B is
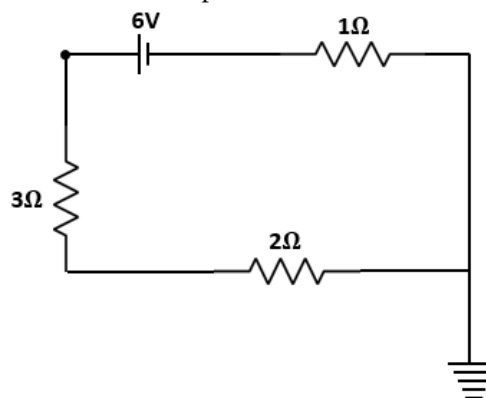
1. 6 volt
2. 5 volt
3. 4 volt
4. 3 volt

172. A battery having e.m.f. E is connected to a variable resistance R. Internal resistance of battery is r. As we increase R, then potential difference across the terminals of battery
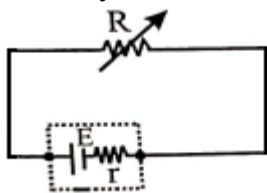
1. Increases
2. Decreases
3. First increase then decreases
4. None of these

173. Charge on the capacitor having capacitance C_2 in steady state is
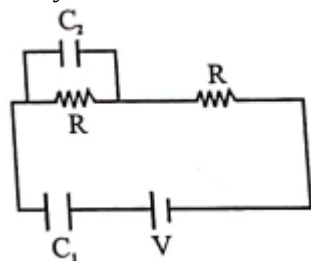
1. Zero
2. $(C_1 + C_2)V$
3. C_2V
4. C_1V

174. A conductor of the variable cross-section is connected across a battery. Let us consider two cross-sections A and a. Let V and v be drift speeds of electrons at those cross-sections respectively then:
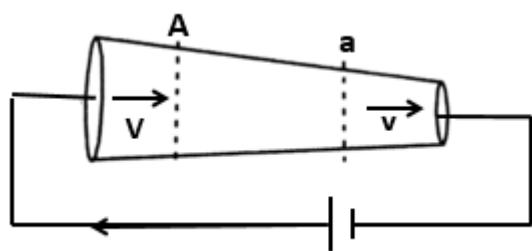
1. AV > av
2. AV = av
3. Av = aV
4. AV < av

175. The capacitor shown in the figure is in steady-state. The energy stored in the capacitor is:
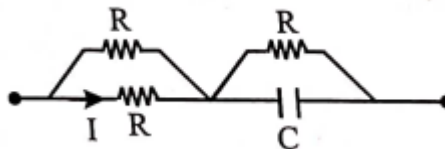
1. CI^2R^2
2. $2CI^2R^2$
3. $4CI^2R^2$
4. $CI^2R^2/2$

176. A uniform conducting wire of the length and radius $l = (10 \pm 0.2)\,cm$ and $r = (1 \pm 0.01)\,cm$ respectively, is cut to form a resistor. The maximum percentage error in the resistance is (assume that the resistivity of the material of the wire is known very accurately)

1. 1%
2. 2%
3. 3%
4. 4%

177. In the circuit shown below, the current distribution, at a certain instant, is indicated. It can be concluded that
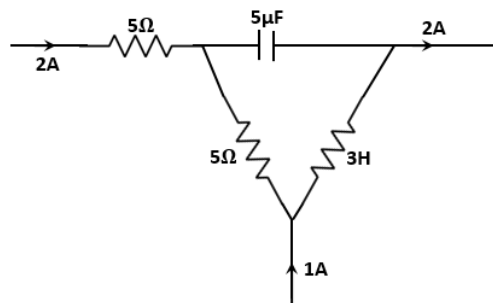
1. the capacitor is charging
2. the inductor is storing energy
3. either(or both) of (A) and (B) are true
4. the above situation is impossible

178. Where is the electric potential due to a charged conducting shell constant?
1. Outside it
2. Inside it
3. Both inside and outside it
4. Neither inside nor outside it

179. In the figure, the electric field on y-axis will be maximum at y =
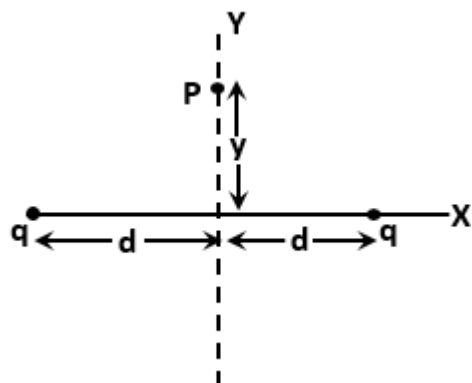
1. $\frac{d}{2}$
2. $\frac{d}{3}$
3. $\frac{d}{\sqrt{2}}$
4. $\frac{d}{\sqrt{3}}$

180. Two charges Q_1 and Q_2 are separated by a distance D. If both Q_1 and Q_2 are doubled, the force is

1. Increased by a factor of 2
2. Decreased by a factor of 2
3. Unchanged
4. Increased by a factor of 4

181. A dielectric material slab of relative permittivity 3 is placed in a uniform electric field $E_0 \hat{i}$. The electric field inside the dielectric due to polarisation is:

1. $\frac{E_0}{3} \hat{i}$
2. $\frac{2E_0}{3} \hat{i}$
3. $\frac{-E_0}{3} \hat{i}$
4. $\frac{-2E_0}{3} \hat{i}$

182. Consider a parallel plate capacitor connected across the terminals of a battery. Now a dielectric slab(of dielectric constant k) is introduced in between the plates so as to completely fill in the space between the plates. New value of electrostatic energy in steady state is

1. k times
2. $\frac{1}{k}$ times
3. same as earlier value
4. Infinite

183. Equipotential surfaces corresponding to a uniform electric field are
1. Straight lines
2. Planar
3. Spherical
4. Ellipsoidal

184. A charged particle (of mass m and charge q) is projected from large distance towards another identical charge with speed v. Potential energy of the system of the charges, at the instant of minimum separation, is
1. $\frac{1}{4}mv^2$
2. $\frac{1}{6}mv^2$
3. $\frac{1}{8}mv^2$
4. Zero

185. A cylinder of height 'H' and radius of cross-section 'R' is kept in a uniform electric field $\overrightarrow{E}$ as shown in the figure. The magnitude of flux that enters from the left half of the cylinder is:
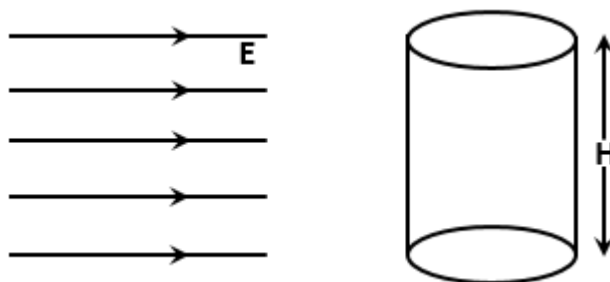
1. $E.\pi R^2$
2. E.RH
3. E.2RH
4. Zero
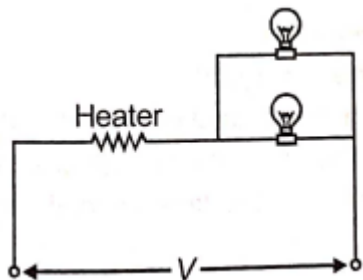
Physics - Section B

186. The equivalent resistance of the circuit between O and A is
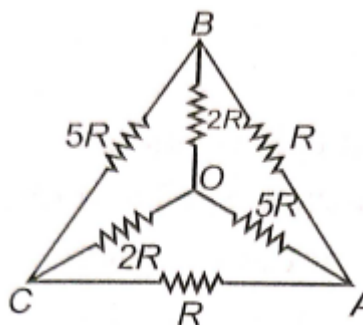

1. $\frac{12R}{13}$
2. $\frac{R}{13}$
3. $\frac{5R}{13}$
4. $\frac{15R}{13}$

187. Two identical bulbs and a heater are connected across a source of constant voltage. If one of the bulbs fuses then


1. Potential drop across heater increases
2. Power output of heater will increase
3. Current through heater increases
4. Brightness of remaining bulb increases

188. Wattage of three bulbs A,B and C rated at same voltage are W_A, W_B and W_C respectively. Their brightness are represented by P_A, P_B and P_C. If $P_A = P_B = P_C$, then correct ratio of their wattage ($W_A : W_B : W_C$) is
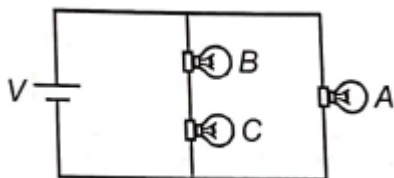
1. 1 : 2 : 4
2. 1 : 2 : 2
3. 1 : 4 : 4
4. 2 : 2 : 1

189. The electric current through a wire varies with time as shown
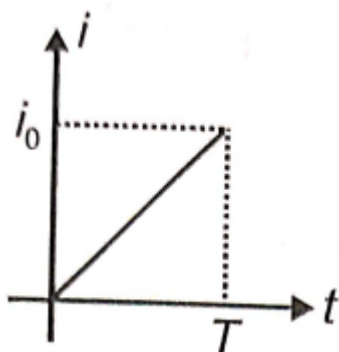
The total charge flown across any cross-section of the wire in time interval 0-T is
1. $i_0 T$
2. $\frac{i_0 T}{2}$
3. $\frac{i_0 T}{3}$
4. $\frac{i_0 T}{\sqrt{2}}$

190. There are two charged particles of same nature, and they are fixed. The position of equilibrium for a third charge will be
1. Near the smaller fixed charge
2. Near the greater fixed charge
3. Outside on the line joining two charges
4. Midway between the charges

191. Which one of the following is correct regarding order of electric field intensity?
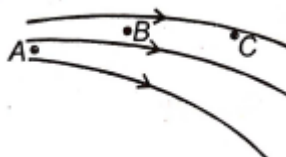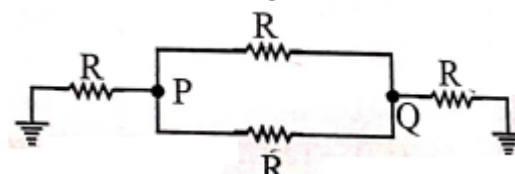

1. $E_A > E_B < E_C$
2. $E_A < E_B < E_C$
3. $E_A = E_B < E_C$
4. $E_A > E_B > E_C$

192. In the potentiometer circuit shown in the figure, the AB is a uniform wire of length 100 cm and resistance 2.4 Ω. The length AC of the wire for which the galvanometer G shows no deflection is 60 cm. The emf of the test cell, ε is
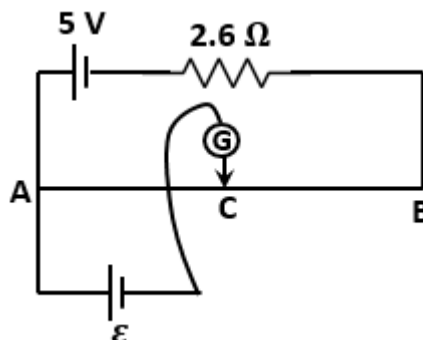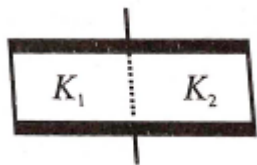

1. 1.56 V
2. 3 V
3. 2.77 V
4. 1.44 V

193. The net resistance between point P and Q in the circuit shown in the figure is

1. $\frac{R}{2}$
2. $\frac{2R}{5}$
3. $\frac{3R}{5}$
4. $\frac{R}{3}$

194. A parallel plate air capacitor which has a capacitance C_0 is half-filled with a dielectric of dielectric constant K_1 and other half is filled with a dielelectric constant K_2, as shown in the figure. The capacitance of the capacitor is


1. $(K_1+K_2)\,C_0$
2. $\frac{1}{2}(K_1+K_2)\,C_0$
3. $2\,(K_1+K_2)\,C_0$
4. $\frac{1}{2}(K_1+K_2-2)\,C_0$

195. A capacitor of capacitance 2 μF is charged to 10V and another capacitor of capacitance 3 μF is charged to 20 V. Now their opposite polarities are connected, the loss of total stored electrical potential energy in this process is
1. 540 μJ
2. 60 μJ
3. 270 μJ
4. zero

196. A dipole of dipole moment p is placed at a distance r from a point charge Q (as shown in figure). Choose the incorrect statement.
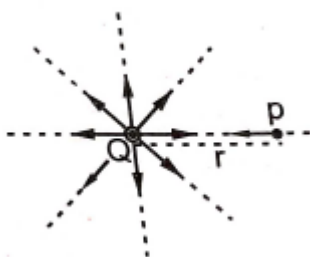
1. Torque acting on the dipole is zero
2. Force acting on the dipole due to the electric field produced by Q is zero.
3. Potential energy of the dipole due to the point charge Q is $\frac{Qp}{4\pi\varepsilon_0 r^2}$
4. Potential energy of dipole is maximum

197. An electric dipole with dipole moment $\vec{p}=\left(3\hat{i}+4\hat{j}\right)$C-m, is kept in electric field $\vec{E}=0.4\,kN/C\hat{i}.$ What is the torque acting on it & the potential energy of the dipole?
1. $1600\,(N\times m)\,\hat{k}$, -1200 J
2. $-1600\,(N\times m)\,\hat{k}$, 1200 J
3. $-1600\,(N\times m)\,\hat{k}$, -1200 J
4. $1600\,(N\times m)\,\hat{k}$, 1200 J

198. Two dielectric slabs are inserted between plates of a parallel plate capacitor as shown in the figure. When connected to a battery, the ratio of the potential difference across the two layers is
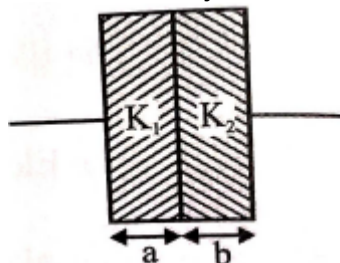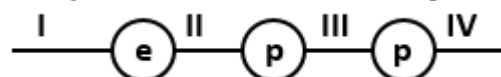

1. $\frac{K_1 b}{K_2 a}$
2. $\frac{K_1 a}{K_2 b}$
3. $\frac{K_2 b}{K_1 a}$
4. $\frac{K_2 a}{K_1 b}$

199. The electric field (E) and potential (V) due to the field are related as $E=-\frac{dV}{dr}$. For the V vs r graph shown, identify the correct E vs r graph

1.

2.

3.

4.
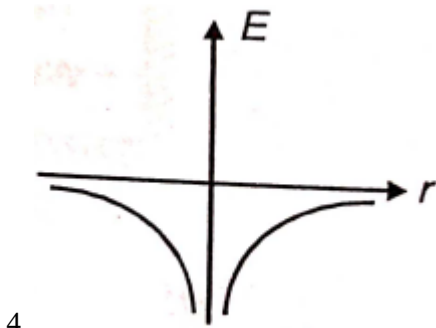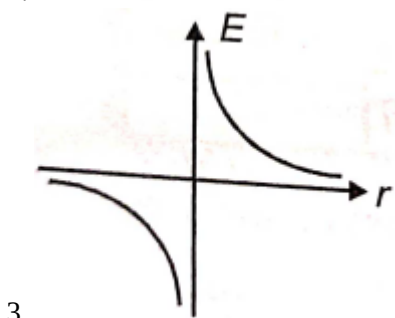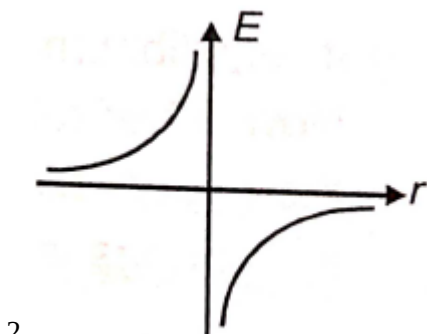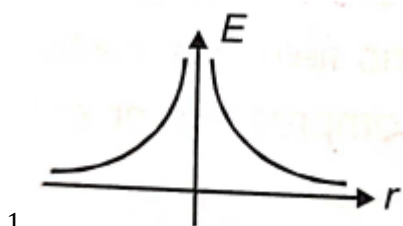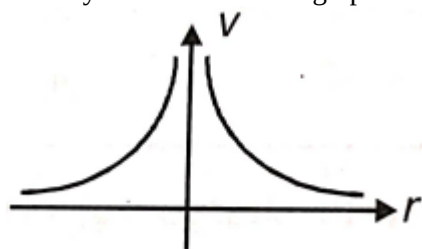
200. In which regions, electric field can be zero for given arrangement of an electron and two protons?

1. I & II
2. I & III
3. I, III & IV
4. Only IV