Sample Question Paper - 33
Science (086)
Class- X, Session: 2021-22
TERM II

Time allowed : 2 hours ***Maximum marks : 40***

General Instructions :

(i) All questions are compulsory.

(ii) The question paper has three sections and 15 questions. All questions are compulsory.

(iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.

(iv) Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

SECTION - A

1. A current of 10 A flows through a conductor for two minutes.

(a) Calculate the amount of charge passed through any area of cross section of the conductor.

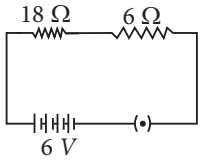
(b) If the charge of an electron is 1.6×10^{-19} C, then calculate the total number of electrons flowing.

2. (a) List three factors on which the resistance of a conductor depends.

(b) Write the SI unit of resistivity.

OR

In the given circuit calculate

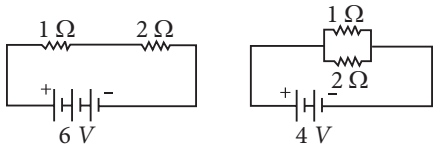


(a) the total resistance of the circuit

(b) current flowing through the circuit

(c) potential difference across the lamp and resistor.

3. Compare the powers used in 2 Ω resistor in each of the following two circuits.

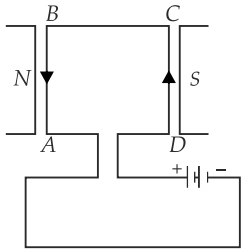


4. What are magnetic field lines? Magnetic field are closed curves. Justify.

5. Draw a diagram representing the magnetic field inside and outside a solenoid through which a current is flowing and mark with arrows, the direction of the current in the solenoid and the direction of the magnetic lines of force. Also mark the polarity at the faces of the solenoid.

OR

A rectangular coil *ABCD* is placed between the pole pieces of a horse-shoe magnet as shown in figure.



(a) What is the direction of force on each arm?

(b) What is the effect of the forces on the coil?

6. Explain different ways to induce current in a coil.

7. What is an ecosystem? Name two types of ecosystem.

OR

What do you mean by biological magnification?

SECTION - B

8. Two elements *A* and *B* belong to the 3rd period of modern periodic table and are in group 2 and 13 respectively. Compare their following characteristics in tabular form.

(a) Their tendencies to lose electrons

(b) Their metallic characters

(c) The formula of their oxides and chlorides

9. The molecular formulae of alkenes *X* and *Y* are C_xH_8 and $C_{10}H_y$ respectively. What are the relative molecular masses of *X* and *Y*?

OR

What is the maximum number of structural isomers possible for pentane with molecular formula C_5H_{12}?

10. Sexually transmitted diseases (STDs) have increasingly become a threat to public health due to changing pattern of sexual behaviour and increasing resistance of pathogens to the antibiotics. What are sexually-transmitted diseases? How can the transmission of such diseases prevented?

11. Explain the process of spore formation in fungi. How spore formation differs from budding?

12. (a) Do larger organisms have more number of chromosomes/cells?

(b) Can organism with fewer chromosomes reproduce more easily than organisms with more number of chromosomes?

(c) "More the number of chromosomes/cells, greater is the DNA content". Justify the statement.

OR

A tall and a short pea plant are crossed and all tall F_1 progenies are obtained. F_1 tall plants are selfed and produced tall and dwarf plants in 3 : 1 ratio in F_2. Find out the genotype of F_1 tall plant.

13. (a) Producers always occupy the first trophic level in any food chain. Why?

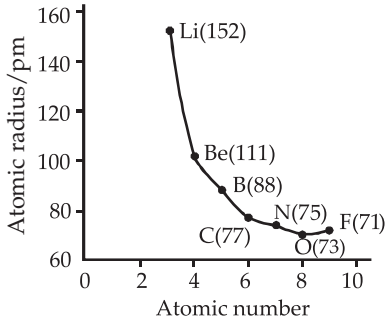
(b) In the given food chain, how much energy will be available to the lion, if 10,000 J of energy is available to the producers?

Plants $\rightarrow$ Deer $\rightarrow$ Lion

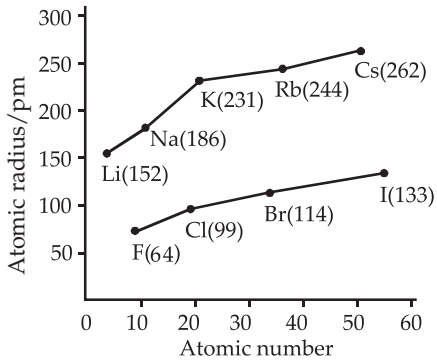
SECTION - C

This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.

14. The distance between the centre of the nucleus and the outermost shell of electrons is known as atomic radius. On moving from left to right along a period, atomic radii decrease because effective nuclear charge increases. For example, the atomic size decreases regularly from Li to F in the second period and from Na to Cl in the third period. It may, however, be noted that in any period, the noble gas has the largest size. On moving down in a group, atomic radii increase.



Atomic radius across a period



Atomic radius in a group

(a) Which element has the smallest size in the third period of the periodic table?

(b) Write the name of the element having smallest size in group 13?

(c) Write the correct order of increasing atomic radii for the following elements : O, C, F, Cl, Br. Give reason.

OR

Out of Al, Si, P, Mg, which element has maximum and minimum atomic radii and why?

15. Flower is the most colourful and beautiful part of the plant. In the early stage, the plants are just leafy and flowers are borne when they reproduce, therefore flowers are the reproductive parts of plant body.

(a) Name the essential and non-essential parts of a flower.

(b) Write the term given to the flower containing only one of the reproductive parts. Give some examples.

(c) Fertilization in flowering plants is not possible without pollination. Justify.

OR

Flowers of *Hibiscus* plant produce fruits even after removal of one of its reproductive part. What could be the possible reason behind the situation?

Solution

SCIENCE - 086

Class 10 - Science

1. Given that : $I = 10$ A, $t = 2$ min $= 2 \times 60$ s $= 120$ s

(a) Amount of charge Q passed through any area of cross-section is given by $I = \frac{Q}{t}$

or $Q = I \times t \;\; \therefore \;\; Q = (10 \times 120)$ A s $= 1200$ C

(b) Since, $Q = ne$

where n is the total number of electrons flowing and e is the charge on one electron

$\therefore \;\; 1200 = n \times 1.6 \times 10^{-19}$

or $n = \frac{1200}{1.6 \times 10^{-19}} = 7.5 \times 10^{21}$

2. (a) Resistance of a conductor depends upon the following factors:

(i) Length of the conductor : Greater the length (l) of the conductor more will be the resistance (R).

$$R \propto l$$

(ii) Area of cross-section of the conductor: Greater the cross-sectional area of the conductor, less will be the resistance.

$$R \propto \frac{1}{A}$$

(iii) Nature of conductor.

(b) SI unit of resistivity is Ω m or ohm-meter.

OR

(a) Total resistance $R_s = 18 + 6 = 24\ \Omega$

(b) Current $I = \frac{V}{R_s} = \frac{6}{24} = 0.25$ A

(c) Potential difference across lamp $= 0.25 \times 18 = 4.5$ V

$\therefore$ Potential difference across resistor $= 6 - 4.5$ V $= 1.5$ V

3. In the first circuit,

Total resistance, $R = 1 + 2 = 3\ \Omega$

Voltage across $2\ \Omega = \frac{V_{\text{Total}}}{R_{\text{Total}}} \times 2\ \Omega = \frac{6}{3} \times 2 = 4$ V

$\therefore$ Power used in $2\ \Omega$ resistor, $P = \frac{V^2}{R} = \frac{(4)^2}{2} = 8$ W

In the second circuit, voltage across both the resistances is same *i.e.*, 4 V and both the resistors are connected in parallel combination.

$\therefore$ Power used in $2\ \Omega$ resistor $= \frac{V^2}{R} = \frac{(4)^2}{2} = 8$ W

$\therefore$ Power used in $2\ \Omega$ resistor in each case is same *i.e.*, 8 W.

4. Magnetic field lines are curved imaginary lines used to show the magnetic field in a given region. It is taken by convention that the field lines emerges from North pole and merge at the South pole. Inside the magnet, the direction of field lines is from its South pole to its North pole. Thus, the magnetic field lines are closed curves.

5.

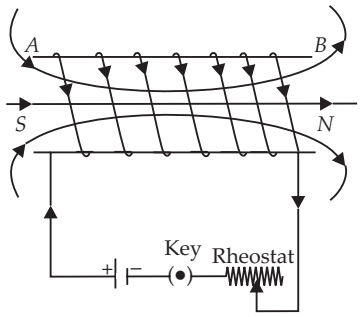


Figure shows the magnetic lines of force due to current carrying solenoid. The direction of current in the solenoid at the face A is clockwise, so it will have the south (S) polarity and the face B of the solenoid will have the north (N) polarity.

OR

(a) In figure, the current in the coil is in direction $DCBA$. By Fleming's left hand rule, in the arm AB, the force is outward at right angle to the plane of the coil. On the arm BC no force acts. On the arm CD, the force is inwards perpendicular to the plane of the coil. On the arm DA, no force acts.

(b) The force on the arms AB and CD are equal in magnitude, but opposite in direction. They form a clockwise couple. So the coil will rotate clockwise with the arm AB coming out and the arm CD going in.

6. Current is induced in a coil in the following ways:

(i) When a magnet is moved towards or away from coil or there is a relative motion between coil and magnet, a current is induced in the coil circuit.

(ii) When a current passing through a coil changes, then a current is induced in a coil placed near it.

7. Ecosystem is the structural and functional unit of the environment comprising of the living organisms and their non-living components that interact by means of food chains and chemical cycles resulting in energy-flow, biotic diversity and material cycling to form a stable system. Natural and artificial are the two types of ecosystem.

OR

Biomagnification is the process of increase in amount

of some toxic, non-biodegradable substances such as DDT and heavy metals in successive trophic levels of a food chain. It results in accumulation of highest concentration of these toxins in topmost trophic level.

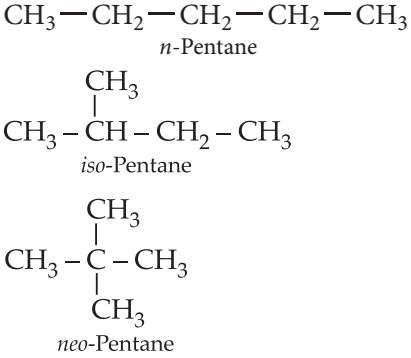
8. Electronic configuration of *A* = 2, 8, 2 *i.e.*, Mg
Electronic configuration of *B* = 2, 8, 3 *i.e.*, Al

	Characteristics	*A*	*B*
(a)	Tendency to lose electron	More	Less
(b)	Metallic character	More	Less
(c)	Formula of their oxides and chlorides	AO, ACl_2	B_2O_3, BCl_3

9. The general formula of an alkene is C_nH_{2n}.
Thus, the molecular formula of *X* is C_4H_8, and the molecular formula of *Y* is $C_{10}H_{20}$.
Molecular mass of *X* = (4 × 12) + (8 × 1) = 56 u
Molecular mass of *Y* = (10 × 12) + (20 × 1) = 140 u

OR

The maximum number of isomers for a pentane is 3.



10. The infectious (communicable) diseases, which spread from an infected person to a healthy person by sexual contact, are called sexually transmitted diseases. These include bacterial infections such as gonorrhoea and syphilis, and viral infections such as warts and HIV-AIDS. Using a covering, called a condom, for the penis during sex helps to prevent transmission of many of these infections to some extent.

11. Spore formation is the most common method of asexual reproduction seen in fungi and bacteria. During spore formation, a structure called sporangium develops from the fungal hypha. The nucleus divides several times within the sporangium and each nucleus with a bit of cytoplasm, develops into a spore. The spores are liberated and they develop into new hypha after reaching the ground. *e.g.*, *Rhizopus*, *Mucor* and *Penicillium.*

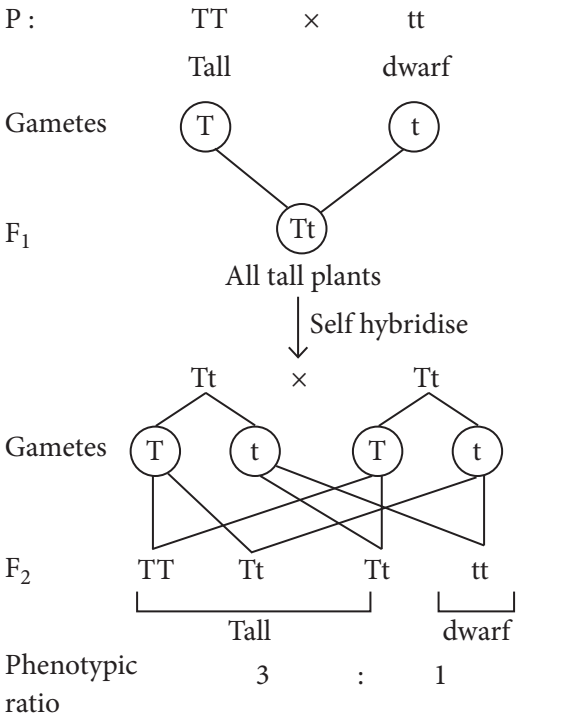
Difference between budding and spore formation are as follows:

Budding	Spore Formation
Process of asexual reproduction where bud develops as an outgrowth of body due to repeated cell division *e.g.*, Yeast, *Hydra*	Spore formation is the process in which tiny bulb like structures called sporangia develop in organisms like *Rhizopus*.

12. (a) No, there is no relationship between size of organism and its chromosome number.
(b) No, process of reproduction follows a common pattern and is not dependent on the number of chromosomes.
(c) The major component of chromosome is DNA thus, if there are more number of chromosomes in a cell, the quantity of DNA will also be more.

OR

As one dwarf plant has been produced in F_2 generation and dwarf character is recessive, dwarf F_2 plant must have gained 't' gene from both its parents. Thus, F_1 plant must have one 't' gene. And, as F_1 plants have also produced tall plants with gene T, thus, it must have gene 'T' in its genotype. Thus F_1 plant has a 'T' and a 't' gene and its genotype will be Tt *i.e.*, hybrid tall.



13. (a) Producers or green plants have chlorophyll which can trap the solar energy. The first trophic level in a food chain is a producer, *i.e.*, those organisms which can produce food with the help of sunlight and chlorophyll by a process called photosynthesis.

(b) As per 10% law of flow of energy in an ecosystem, only 10% of energy is received by the next trophic level. Hence, in the given food chain :

Plants	→	Deer	→	Lion
10, 000 J		1000 J		100 J

14. (a) Atomic size decreases across the period but, Cl has smaller size than Ar. Argon has larger atomic size due to van der Waals' radius.

(b) Boron is the first element of group 13, hence it is smallest in size.

(c) Atomic size decreases from left to right in a period and increases from top to bottom in a group. Thus, the order is F < O < C < Cl < Br.

OR

Mg has maximum atomic radius and P has minimum atomic radius, as, on moving from left to right along a period nuclear charge increases which tends to pull the electrons closer and reduces the size of atom, while on moving down the group new shells are being added and this increases the distance between the outermost electron and nucleus, hence atomic size increases.

15. (a) Sepals and petals form the non-essential parts of a flower whereas stamens and carpels constitute the essential parts of a flower.

(b) Unisexual flowers bear organs of only one sex *i.e.*, either stamen or pistil. *e.g.*, Papaya, Watermelon.

(c) Pollination allows pollen grains to reach carpel which contains the egg. Thus, fertilization which involves fusion of male and female germ cells can occur only after pollination.

OR

Stamens and carpels are the male and female reproductive parts of a flower respectively. *Hibiscus* is a bisexual flower. When the stamens of its flower were removed, the flower still bears the female reproductive part, that is, carpel. Through cross pollination, fertilization could take place and flower can produce fruit after fertilization.