Sample Question Paper - 32
Science (086)
Class- X, Session: 2021-22
TERM II

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

General Instructions :

(i) All questions are compulsory.

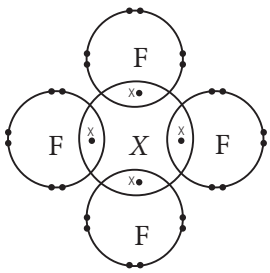
(ii) The question paper has three sections and 15 questions. All questions are compulsory.

(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. The diagram below shows the electron arrangement in a compound formed between element *X* and fluorine.



(a) (i) What is the formula of this compound?

(ii) Is this an ionic or covalent compound? Give your reason.

(b) In which group of the periodic table can you find element *X* ?

2. Consider a metal *M* with electronic configuration : 2, 8, 3.

(a) To which group and period of periodic table does *M* belong?

(b) Write the formulae of its sulphate and phosphate.

3. Name two organisms each which reproduce by fragmentation, regeneration and budding.

4. Colonies of yeast fail to multiply in water, but multiply in sugar solution. Give one reason for this.

5. In human beings, the statistical probability of getting either a male or female child is 50 : 50. Justify.

OR

(a) Mendel selected garden pea plant as an experimental plant due to its advantage over other plants. Write any two selection criteria for selecting garden pea plant.

(b) What do you mean by a true breeding plant?

6. Can you think of magnetic field configuration with three poles?

OR

What are magnetic field lines? Justify the following statements : Magnetic field are closed curves.

7. The following organisms form a food chain.

Insect, Hawk, Grass, Snake, Frog

Which of these organisms will have the highest concentration of non-biodegradable chemicals? Name the phenomenon.

OR

Ecosystem is a community where all the living organisms interact with the nonliving constituents of the environment. Is an aquarium a complete ecosystem? Explain.

SECTION - B

8. Draw the structures of the following compounds :

(i) Acetic acid (ii) Chloroform (iii) Ethanol

9. Two elements *A* and *B* belong to group 1 and 2 respectively in the same period. Compare them with respect to :

(a) the number of valence electrons (b) valency

(c) metallic character (d) size of the atoms.

OR

Four elements *A*, *B*, *C* and *D* along with their configurations are given below :

Element *A* – 2, 1; Element *B* – 2, 8; Element *C* – 2, 8, 1; Element *D* – 2, 8, 8.

(i) Which two elements belong to the same period?

(ii) Which two elements belong to the same group?

(iii) Which element out of *A* and *C* is more reactive and why?

(iv) Which element out of *A* and *B* forms more number of compounds?

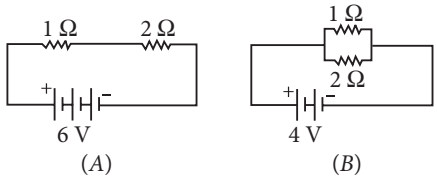
10. Mendel performed several experiments that include monohybrid, dihybrid and trihybrid crosses. On the basis of these experiments, mendel formulated laws of heredity. How do Mendel's experiment shows that traits are inherited independently?

11. Write Joule's law of heating.

12. In a house 4 bulbs of 100 watt each are lighted for 5 hours daily, 2 fans of 50 watt each are used for 10 hours daily and a refrigerator of 1.00 kW is used for half an hour daily. Calculate the total energy consumed in a month of January and its cost at the rate of ₹ 3.60 per kWh.

OR

Compare the power used in 2 Ω resistor in each of the following circuits.



13. How the present environment is negatively effected due to modern lifestyle ?

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. Asexual reproduction is a way by which organisms can give rise to new organisms. It is a mode of reproduction that involves a single parent and take place in unicellular as well as in multiculluar organisms.

(a) Name the mode of reproduction of the following organisms and state the important feature of each mode :

(i) *Planaria*

(ii) *Hydra*

(iii) *Rhizopus*

(b) We can develop new plants from the leaves of *Bryophyllum*. Comment.

(c) List two advantages of vegetative propagation over other modes of reproduction.

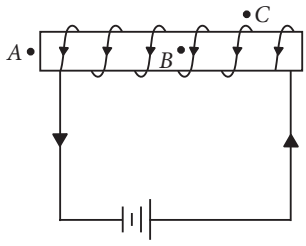
OR

Differentiate binary fission from multiple fission and give one example of each.

15. When current is flowing through the solenoid, the magnetic field line pattern resembles exactly with those of a bar magnet with the fixed polarity, *i.e.*, North and South pole at its ends and it acquires the repulsive and attractive properties similar to bar magnet. Hence, the current carrying solenoid behaves as a bar magnet.

(a) What are the uses of solenoid?

(b) Draw magnetic filed lines for the current carrying solenoid as shown in figure and explain that out of three points *A*, *B* and *C,* at which point, magnetic field strength is maximum.



(c) How does a solenoid behave like a magnet? Can you determine the North and South poles of a current-carrying solenoid with the help of a bar magnet? Explain.

OR

Explain the phenomenon of electromagnetic induction briefly.

Solution

SCIENCE - 086

Class 10 - Science

1. (a) (i) XF_4

(ii) It is a covalent compound.

The diagram shows that an atom of *X* shares four pairs of electrons with four atoms of fluorine to form the molecule XF_4. Sharing of electrons is a characteristic of covalent compound.

(b) Element *X* has four valence electrons hence, it belongs to group 14 of the periodic table.

2. (a) As, there are 3 electrons in valence shell hence *M* belongs to group 13. Also, as electrons are filled in 3 shells, (*K*, *L*, *M*) thus '*M*' belongs to 3rd period.

(b) As, '*M*' has 3 electrons in its valence shell, thus it contributes 3 electrons in bonding.

Formulae for sulphate and phosphate are $M_2(SO_4)_3$ and MPO_4 respectively.

3. Fragmentation — *Spirogyra* and starfish
Regeneration — *Hydra* and *Planaria*
Budding — *Hydra* and yeast

4. Yeast multiplies by the process of budding. It requires energy for sustaining all its life activities.

Sugar provides energy to yeast whereas water does not provide energy, so it fails to multiply in water because of inadequate energy.

5. Human females are homogametic (44 + XX), that is they produce only one type of ova (22 + X). Human males are heterogametic. They produce two types of sperms : (22 + X) and (22 + Y) in equal proportion that is 50 : 50 ratio. The chance of getting male or female child is also 50 : 50, as there is equal chance of androsperm (22 + Y) or gynosperm (22 + X) fertilising an ovum.

OR

(a) The two selection criterias are as follows :

(i) Garden pea plant has short life cycle which makes it possible to study several generation in a short time period.

(ii) Garden pea plant shows several well defined contrasting characters such as plant height, pod and flower colour, etc.

(b) A true breeding plant is the one that when self-fertilised, produces offspring with the same traits. They will be either homozygous dominant or homozygous recessive.

6. Magnetic poles always exist in pairs. However one can imagine magnetic field configuration with three poles - when North poles of two magnets are glued together or South poles of two magnets are glued together to provide three field configuration.

OR

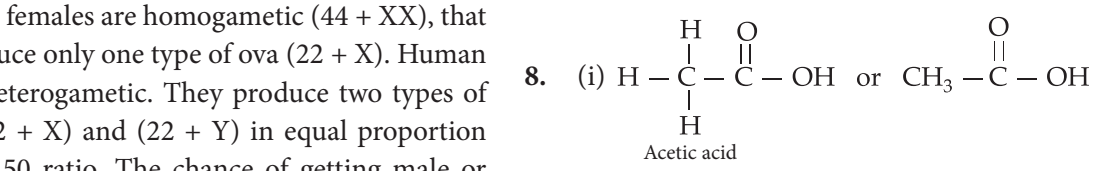
Magnetic field lines are curved imaginary lines used to show the magnetic field in a given region.

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.

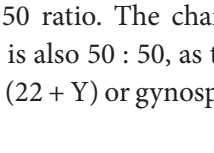
7. Highest concentration of harmful non-biodegradable chemicals are found in top consumer hawk. The phenomenon exhibited here is biomagnification.

OR

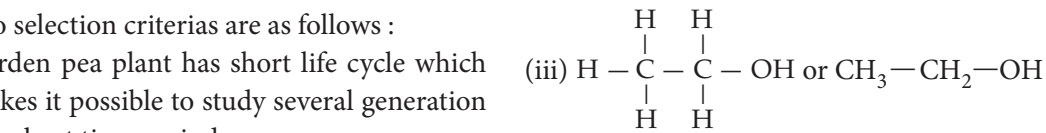
Yes, a balanced and large aquarium can be a complete ecosystem consisting of both biotic and abiotic components. Water, oxygen supply source, light source are abiotic factors, whereas aquatic plants, small animals and decomposers serve as biotic components.

8. (i) 

Acetic acid

(ii) 

Chloroform

(iii) 

Ethanol

9. (a) Number of valence electrons in *A* = 1 and *B* = 2.

(b) Valency of *A* is one while *B* is two.

(c) Element *A* (group 1) is more metallic as compared to *B* (group 2).

(d) Element *B* (group 2) is smaller than element *A* (group 1) in size.

OR

(i) Elements in a period have same number of shells. Thus, elements *A* and *B* belong to the second period while *C* and *D* belong to the third period.

(ii) Elements in a group have same number of valence electrons. Thus, elements *A* and *C* belong to the same group 1, and elements *B* and *D* belong to the same group 18.

(iii) Element *C* is more reactive than element *A* due to its bigger size and weaker force of attraction of the nucleus on the valence electrons.

(iv) Elements *B*, being a noble gas does not form compounds. Hence, element *A* forms more number of compounds than element *B*.

10. In a dihybrid cross given by Mendel, it was observed that when two pairs of traits or characters were considered, each trait expressed independent of the other. Thus, Mendel was able to propose the Law of Independent Assortment, which state that pair of genes separate independently of each other during gamete formation. This could be explained clearly from the given cross:

P generation: RRYY × rryy

Round yellow seeds — Wrinkled green seeds

Gametes: RY, ry

F_1 generation: RrYy

Round yellow seeds

Selfing

	RY	Ry	rY	ry
RY	RRYY Round yellow	RRYy Round yellow	RrYY Round yellow	RrYy Round yellow
Ry	RRYy Round yellow	RRyy Round green	RrYy Round yellow	Rryy Round green
rY	RrYY Round yellow	RrYy Round yellow	rrYY Wrinkled yellow	rrYy Wrinkled yellow
ry	RrYy Round yellow	Rryy Round green	rrYy Wrinkled yellow	rryy Wrinkled green

F_2 generation ratio: 9 (Round-yellow) : 3 (Round-green) : 3 (Wrinkled-yellow) : 1 (Wrinkled-green)

11. The Joule's law of heating implies that heat produced in a resistor is

(i) directly proportional to the square of current for a given resistance,

(ii) directly proportional to resistance for a given current, and

(iii) directly proportional to the time for which the current flows through the resistor.

i.e., $H = I^2 R t$

12. Power of each bulb = 100 watt

Total power of 4 bulbs, $P_1 = 4 \times 100 = 400$ watt

Energy consumed by bulbs in 1 day

$E_1 = P_1 \times t = 400$ watt $\times$ 5 hours = 2000 Wh = 2 kWh

Power of each fan = 50 watt

Total power of 2 fans = 2×50 watt $P_2 = 100$ watt

Energy consumed by fans in 1 day

$E_2 = P_2 \times t = 100$ watt $\times$ 10 hours

= 1000 watt hour = 1 kWh

Energy consumed by refrigerator,

$E_3 = 1$ kW $\times$ 1/2 h = 0.5 kWh

Total energy consumed in one day

$E = E_1 + E_2 + E_3 = (2 + 1 + 0.5)$ kWh = 3.5 kWh

Total energy consumed in a month of January (31 days)

$= E \times 31 = (3.5 \times 31)$ kWh = 108.5 kWh

Cost of energy consumed = ₹ (108.5×3.60) = ₹ 390.6

OR

In circuit *A*, Total resistance, $R = 1 + 2 = 3\ \Omega$

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

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

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

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

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

13. With the advancement in technology over time, there has been improvement in lifestyle of people. Such changes have also changed their attitudes. When people have more resources at their end they tend to overuse and misuse it thereby generating huge amounts of waste materials. For example, the affluent lifestyle has forced people to start using more of disposable articles, *e.g.*, plastic cups, bags, etc., which keep on accumulating in the environment and

lie undecomposed, thereby negatively affecting the environment.

Similarly, excessive use of refrigerators and air conditioners, plastic foams, etc., also release high quantities of CFCs which are responsible for ozone depletion.

14. (a) (i) *Planaria* – Regeneration

– Regeneration of organism from its cut body parts occurs by the process of growth and development.
– Regeneration is an asexual mode of reproduction common in lower plants and animals.

(ii) *Hydra* – Budding

– In budding, a small part of the body of the parent organism grows out as a bud which on detaching forms a new organism.
– Budding occurs in yeast, some protozoans and certain lower animals.

(iii) *Rhizopus* – Spores

– Spores are usually produced in sporangia.
– Spore formation is a common method of an asexual reproduction in bacteria and most of the fungi.

(b) The leaves of a *Bryophyllum* have special type of buds in their margins. These buds may get detached from the leaves, fall to ground and then grow to produce new *Bryophyllum* plants. The buds can also drop to the ground together with the leaf and then grow to produce new plants.

(c) Advantages of vegetative propagation are :

(i) It is a quick method of propagation.

(ii) The new plants produced by artificial vegetative propagation are exactly like the parent plants.

(iii) Many plants can be grown from one plant by vegetative propagation.

OR

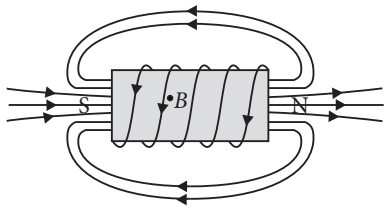
In binary fission the parent organism splits into two new organisms and the nucleus of the parent body divides only once to produce two nuclei, whereas in multiple fission the parent organism splits into many new organisms and the nucleus of the parent body divides repeatedly to produce many nuclei.

Example of binary fission – *Leishmania*

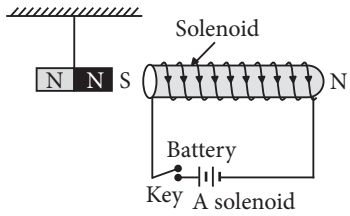
Example of multiple fission – *Plasmodium.*

15. (a) Solenoid are used to form temporary magnet called electromagnet. The electromagnet has more advantages over permanent bar magnet as electromagnets can be turned on and off making them effective as controls and switches.

(b) Outside the solenoid magnetic field is minimum. At the ends of solenoid, magnetic field strength is half to that inside. So maximum field strength is at point *B*.



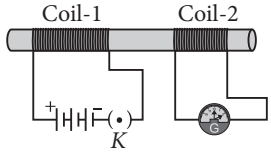
(c) When current is passed through a solenoid, it acts as a bar magnet. Suspend a bar magnet from a support. Bring a current-carrying solenoid near the North pole of the bar magnet. Observe if it gets attracted or repelled.



Now, perform the same action for south pole of the bar magnet.

Following the rule that opposite poles attract each other, one can identify the poles of the solenoid.

OR



To explain electromagnetic induction take two different coils of copper wire having large number of turns (say 100 and 50 turns respectively).

Insert them over a non-conducting cylindrical roll, as shown in figure. Connect the coil-1, having large number of turns, in series with a battery and a plug key. Also connect the other coil-2 with a galvanometer as shown.

Plug in the key. Observe the galvanometer. You will observe that the needle of the galvanometer instantly jumps to one side and just as quickly returns to zero, indicating a momentary current in coil-2.

Hence, the change in magnetic field lines associated with the coil-2 is the cause of induced electric current in it.