CBSE 2020 Science — Set 3

English Medium

Time Allowed: 3 Hours | Maximum Marks: 80

General Instructions:

1. This question paper contains 39 questions. All questions are compulsory.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 6 questions carrying 2 marks each.
4. Section C has 7 questions carrying 3 marks each.
5. Section D has 3 questions carrying 5 marks each.
6. Section E has 3 case-study based questions carrying 4 marks each.
7. Draw neat diagrams wherever required.

Section A

Multiple Choice Questions (1 mark each)

Q.1 [1 mark]

How are covalent bonds formed?

Q.2 [1 mark]

Define electropositivity.

OR

Q.2 [1 mark]

The atomic radii of first group elements are given below:

Group-I Element — Atomic Radii (pm):
Na — 86
K — 231
Rb — 244
Cs — 282

State the reason behind the observed trend in the above elements.

Q.3(a) [1 mark]

(Based on the passage about Tehri Dam)
The Tehri Dam is the highest dam in India and one of the highest in the World. The Tehri Dam withholds a reservoir of capacity 4.0 km^3 and surface area 52 km^2. It is used for irrigation, municipal water supply and the generation of 1000 MW of hydro electricity.
The Tehri Dam has been the object of protests. Environment activist Shri Sunder Lal Bahuguna led the 'Anti Tehri Dam Movement' from 1980s to 2014. The protest was against the displacement of town inhabitants and environmental consequences of the weak ecosystem. The relocation of more

than 1,00,000 people from the area has led to protracted legal battles over resettlement rights and ultimately resulted in the delayed completion of the project.

(a) How is hydropower harnessed?

Q.3(b) [1 mark]

(Based on Tehri Dam passage)

(b) Define 1 MW.

Q.3(c) [1 mark]

(Based on Tehri Dam passage)

(c) Mention two disadvantages of constructing Tehri Dam.

Q.3(d) [1 mark]

(Based on Tehri Dam passage)

(d) What happens when water from great heights is made to fall on blades of turbine?

Q.4(a) [1 mark]

(Based on passage about TSH levels in women)

Thyroid Stimulating Hormone (TSH) levels in women are based on the table given below:

Age Range — Normal (mU/L) — Low (mU/L):
18–29 years: 0.4–2.34 mU/L (Normal), < 0.4 mU/L (Low)
30–49 years: 0.4–4.0 mU/L (Normal), < 0.4 mU/L (Low)
50–79 years: 0.46–4.68 mU/L (Normal), < 0.46 mU/L (Low)

Women are at greater risk for developing abnormal TSH levels during menstruation, while giving birth and after going through menopause. Around

5% of women in the United States have some kind of thyroid problem compared to 3% of men. Despite claims that high TSH increases your risk for heart disease, a 2013 study found no link between high TSH and heart diseases. But a 2017 study showed that older women are especially at risk for developing thyroid cancer if they have high TSH levels along with thyroid nodules.

(a) A 35 year old woman has TSH level 6.03 mU/L. What change should she bring in her diet to control this level?

Q.4(b) [1 mark]

(Based on TSH passage)

(b) When do women face a greater risk of abnormal TSH level?

Q.4(c) [1 mark]

(Based on TSH passage)

(c) State the consequences of low TSH level.

Q.4(d) [1 mark]

(Based on TSH passage)

(d) Name the mineral that is responsible for synthesis of hormone secreted by thyroid gland.

Q.5 [1 mark]

The sky appears dark to passengers flying at very high altitudes mainly because:

(a) Scattering of light is not enough at such heights.
(b) There is no atmosphere at great heights.
(c) The size of molecules is smaller than the wavelength of visible light.
(d) The light gets scattered towards the earth.

Q.6 [1 mark]

A cylindrical conductor of length 'l' and uniform area of cross section 'A' has resistance 'R'. The area of cross section of another conductor of same material and same resistance but of length '2l' is:

(a) A/2
(b) A/2
(c) 3A
(d) 3A

Q.7 [1 mark]

The maximum resistance which can be made using four resistors each of resistance 1/2 Ω is:

(a) 2 Ω
(b) 1 Ω
(c) 2.5 Ω
(d) 8 Ω

Q.8 [1 mark]

A diagram of traditional water harvesting system is given below (showing components A, B, and C with a sloped terrain, a wall structure, and a well):

The statement which defines the system and its parts is:

(a) This is an ideal setting of the Khadin system and A = Catchment area; B = Saline area & C = Shallow dugwell
(b) This is an ideal setting of the Shallow dugwell system and A = Catchment area; B = Saline area and C = Khadin
(c) This is an ideal setting of Catchment area and A = Khadin, B = Saline area and C = Shallow dugwell
(d) This is showing Saline area and A = Catchment area; B = Khadin and C = Shallow dugwell

OR

Q.8 [1 mark]

The major ill effect of mono culture practice in forests is on the:

(a) biodiversity which faces large destruction
(b) local people whose basic needs can no longer be met from such forests
(c) industries
(d) forest department

Q.9 [1 mark]

Several factories were pouring their wastes in rivers A and B. Water samples were collected from these two rivers. It was observed that sample collected from river A was acidic while that of river B was basic. The factories located near A and B are:

(a) Soaps and detergents factories near A and alcohol distillery near B
(b) Soaps and detergents factories near B and alcohol distillery near A
(c) Lead storage battery manufacturing factories near A and soaps and detergents factories near B
(d) Lead storage battery manufacturing factories near B and soaps and detergents factories near A

Q.10 [1 mark]

In which of the following, the identity of initial substance remains unchanged?

(a) Curdling of milk
(b) Formation of crystals by process of crystallisation
(c) Fermentation of grapes
(d) Digestion of food

Q.11 [1 mark]

An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. The following

statement is true for solutions 'A' and 'B':

(a) A is a strong base and B is a weak base.
(b) A is a strongly acidic and B is a weak acid.
(c) A has pH greater than 7 and B has pH less than 7.
(d) A has pH less than 7 and B has pH greater than 7.

Q.12 [1 mark]

An element 'X' is forming an acidic oxide. Its position in modern periodic table will be:

(a) Group 1 and Period 3
(b) Group 2 and Period 3
(c) Group 13 and Period 3
(d) Group 16 and Period 3

OR

Q.12 [1 mark]

Consider the following statements about an element 'X' with number of protons 13.

The correct statement(s) is/are:

(a) only (A)
(b) only (B)
(c) (A) and (C)
(d) (A), (B) and (C)

Q.13 [1 mark]

Assertion (A): CH_3OH, CH_3CH_2OH and $CH_3CH_2CH_2OH$ are members of a homologous series.

Reason (R): A series of compounds with same functional group but differing by $–CH_2–$ unit is called a homologous series.

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

Q.14 [1 mark]

Assertion (A): Alloys are commonly used in electrical heating devices like electric iron and heater.

Reason (R): Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points than their constituent metals.

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

Q.15 [1 mark]

Mention with reason the colour changes observed when:
(i) silver chloride is exposed to sunlight.
(ii) copper powder is strongly heated in the presence of oxygen.
(iii) a piece of zinc is dropped in copper sulphate solution.

Q.16 [1 mark]

Complete and balance the following chemical equations:
(i) $NaOH(aq) + Zn(s) \rightarrow$
(ii) $CaCO_3(s) + H_2O(l) + CO_2(g) \rightarrow$
(iii) $HCl(aq) + H_2O(l) \rightarrow$

OR

Q.16 [1 mark]

During electrolysis of brine, a gas 'G' is liberated at anode. When this gas 'G' is passed through slaked lime, a compound 'C' is formed, which is used for disinfecting drinking water.

(i) Write formula of 'G' and 'C'.

(ii) State the chemical equation involved.

(iii) What is common name of compound 'C'? Give its chemical name.

Q.17 [1 mark]

Study the data of the following three categories A, B and C.

Category A: Li (7), Na (23), K (39)
Category B: N (14), P (31), As (74)
Category C: B (10.8), Al (27), Ga (69.7)

(i) From the given three categories A, B and C, pick the one which forms Dobereiner's Triads.

(ii) Why did Mendeleev placed elements of category A, B and C in three different groups?

(iii) Is Newland law of octaves applicable to all the three categories? Give reason to justify your answer.

Q.18(a) [1 mark]

(a) From the following group of organisms create a food chain which is the most advantageous for Human beings in terms of energy.

Hawk, Rat, Cereal plant, Goat, Snake, Human Being

(b) State the possible disadvantage if the cereal plant is growing in soil rich in pesticides.

(c) Construct a food web using the organisms mentioned above.

OR

Q.18 [1 mark]

(a) Write two harmful effects of using plastic bags on the environment. Suggest alternatives to the usage of plastic bags.

(b) List any two practices that can be followed to dispose off the waste produced in our homes.

Q.19 [1 mark]

(a) State the role played by the following in the process of digestion.

(i) Enzyme trypsin

(ii) Enzyme lipase

(b) List two functions of finger like projections present in the small intestine.

Q.20 [1 mark]

(a) Classify the following as homologous or analogous pairs:

(i) Broccoli and Cabbage

(ii) Ginger and Radish

(iii) Fore limbs of birds and lizard

(iv) Wings of a bat and Wings of a bird

(b) State the main feature that categorises a given pair of organs as homologous or analogous.

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other.

(a) List your observations regarding:

(i) Colour of stems in their F_1 progeny

(ii) Percentage of brown stemmed plants in F_2 progeny if F_1 plants are self pollinated.

(iii) Ratio of GG and Gg in the F_2 progeny.

(b) Based on the findings of this cross, what conclusion can be drawn?

Q.22 [2 marks]

The diagram given below shows an object O and its image I.

(Diagram shows a lens with object O on one side and image I on the other, with markings at 2F, F on both sides)

Without actually drawing the ray diagram, state the following:

(i) Type of lens (Converging / Diverging)

(ii) Name two optical instruments where such an image is obtained.

(iii) List three characteristics of the image formed if this lens is replaced by a concave mirror of focal length 'f' and an object is placed at a distance '9f/2' in front of the mirror.

Q.23 [2 marks]

Give reasons for the following:

(i) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid.

(ii) The current carrying solenoid when suspended freely rests along a particular direction.

(iii) The burnt out fuse should be replaced by another fuse of identical rating.

Q.24 [2 marks]

(a) With the help of labelled ray diagram show the path followed by a narrow beam of monochromatic light when it passes through a glass prism.

(b) What would happen if this beam is replaced by a narrow beam of white light?

OR

Q.24 [2 marks]

(a) A person is suffering from both myopia and hypermetropia.

(i) What kind of lenses can correct this defect?

(ii) How are these lenses prepared?

(b) A person needs a lens of power +3D for correcting his near vision and –3D for correcting his distant vision. Calculate the focal lengths of the lenses required to correct these defects.

Q.25 [2 marks]

Write balanced chemical equations to explain what happens, when:

(i) Mercuric oxide is heated.

(ii) Mixture of cuprous oxide and cuprous sulphide is heated.

(iii) Aluminium is roasted with manganese dioxide.

(iv) Ferric oxide is reduced with aluminium.

(v) Zinc carbonate undergoes calcination.

OR

Q.25 [2 marks]

(i) By the transfer of electrons, illustrate the formation of bond in magnesium chloride and identify the ions present in this compound.

(ii) Ionic compounds are solids. Give reasons.

(iii) With the help of a labelled diagram show the experimental set up of action of steam on a metal.

Q.26 [2 marks]

(a) Compare soaps and detergents on the basis of their composition and cleansing action in hard water.

(b) What happens when ethanol is treated with sodium metal? State the behaviour of ethanol in this reaction.

(c) Draw the structure of cyclohexane.

(d) Name the following compound:

H—C—C—H with H atoms attached and a double bond (C_2H_2 / Ethyne structure shown as H–C≡C–H)

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

(a) Write the correct sequence of steps followed during journey of oxygen rich blood from lungs to various organs of human body.

(b) What happens when the system of blood vessels develop a leak?

Q.28 [3 marks]

(a) Draw a diagram showing germination of pollen on stigma and mark on it the following organs/parts:

(i) Pollen Grain

(ii) Pollen tube

(iii) Stigma

(iv) Female germ cell

(b) State the significance of pollen tube.

(c) Name the parts of flower that develop after fertilization into:

(i) Seed

(ii) Fruit

OR

Q.28 [3 marks]

(a) 'Use of a condom is beneficial for both the sexes involved in a sexual act.' Justify this statement giving two reasons.

(b) How do oral contraceptives help in avoiding pregnancies?

(c) What is sex selective abortion? How does it affect a healthy society? (State any one consequence)

Q.29 [3 marks]

(a) For the combination of resistors shown in the following figure, find the equivalent resistance between M and N.

(The figure shows resistors R_1, R_2, R_3 with R_1 in series and R_2, R_3 in parallel between points M and N)

(b) State Joule's law of heating.

(c) Why we need a 5 A fuse for an electric iron which consumes 1 kW power at 220 V?

(d) Why is it impracticable to connect an electric bulb and an electric heater in series?

Q.30(a) [3 marks]

(a) A security mirror used in a big showroom has radius of curvature 5 m. If a customer is standing at a distance of 20 m from the cash counter, find the position, nature and size of the image formed in the security mirror.

(b) Neha visited a dentist in his clinic. She observed that the dentist was holding an instrument fitted with a mirror. State the nature of this mirror and reason for its use in the instrument used by dentist.

OR

Q.30 [3 marks]

Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.

(i) State the nature of the lens and reason for its use.

(ii) Where should the palmist place/hold the lens so as to have a real and magnified image of an object?

(iii) If the focal length of this lens is 10 cm and the lens is held at a distance of 5 cm from the palm, use lens formula to find the position and size of the image.