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Selection Test – 2018

Sub: Physical science
Duration: 3 hrs 15 mins

Class: 10
Date: 16/11/2018

F.M: 90

ANSWER KEY

GROUP-A
(Multiple Choice Question)

1. Answer the following questions: 1×15
- 1.1 Which of the following gas is the most responsible for 'green house' effect? **CO₂**
 - 1.2 An object is placed in front of a convex mirror, the image is always – **VIRTUAL, DIMINISHED**
 - 1.3 When white light is dispersed by a prism, the colour of light at the top of the spectrum formed is- **RED**
 - 1.4 Which of the following radioactive rays has greater penetrating power? **GAMMA RAYS**
 - 1.5 Which of the following element combines with hydrogen to give covalent compound? **N**
 - 1.6 H₂S is dried by passing through which of the following? **Al₂O₃**
 - 1.7 The compound responsible for sour taste of vinegar is – **ACETIC ACID**
 - 1.8 What is the no. of molecules present in 4gm methane? – **1.505*10²³**
 - 1.9 The catalyst used for the preparation of ammonia from N₂ and H₂ is - **Fe**
 - 1.10 The alkyl group of the carboxylic acid having the molecular formula C₃H₆O₂ is - **Ethyl**
 - 1.11 Which of the following contains largest no. of molecules? – **1 gram molecule of SO₂**
 - 1.12 For an object placed at infinity in front of a concave mirror, the image formed is – **None of these.**
 - 1.13 Near and far point of a normal human eye respectively are – **25 cm & INFINITY**
 - 1.14 The shape of NaCl crystal is - **OCTAHEDRAL**
 - 1.15 The correct electron affinity order among the halogens – **I<Br<F<Cl**

Group-B

2. Answer the following questions in one word or in one sentence. (Alternatives are to be noted) **1 × 21 = 21**

2.1 What is the full form of LPG?

Ans: Liquefied petroleum gas.

2.2 According to _____ law, the volume of certain amount of gas could be zero.

Ans: Charles' law.

2.3 Absolute zero temperature = _____ °C.

Ans: -273°C

Or

How does the kinetic energy of the gas molecules vary with decrease in temperature?

Ans: kinetic energy of the gas molecules decreases with decrease in temperature.

2.4 Coefficient of linear expansion of iron is $12 \times 10^{-6}/^{\circ}\text{C}$, what will be its coefficient of superficial expansion?

Ans: Coefficient of superficial expansion = $2 \times 12 \times 10^{-6}/^{\circ}\text{C} = 24 \times 10^{-6}/^{\circ}\text{C}$.

2.5 What is the SI unit of coefficient of apparent expansion of liquid?

Ans: K⁻¹.

2.6 If a beam of parallel ray is made incident on a convex lens such that the rays are not parallel to the principal axis, then where will they converge after refraction?

Ans: They will converge somewhere on the focal plane.

Or

Mention one practical use of spherical mirror.

Ans: Convex mirror is used as the rear view mirror in cars, scooters and two-wheelers.

Or, concave mirror is used for the shaving mirror and as a reflector.

Or, concave mirror is used for dentist's mirror.

2.7 What will be the measure of angle of refraction if the incident ray makes 90° angle with the surface of separation?

Ans: Angle of refraction will be 0° .

2.8 Electrical switches are always connected with neutral wire – write true or false.

Ans: False.

Or

The terminal voltage of an electric cell is _____ the e.m.f of the cell. 0

Ans: **Terminal voltage of an electric cell is < the e.m.f of the cell**

2.9 Write down one important difference between A.C Generator and Electric motor.

Ans: **A.C. Generator converts mechanical energy into Electrical energy**

But, Electric motor converts electrical energy into mechanical energy.

2.10 The velocity of α particle in space is usually $\frac{9}{10}$ th of velocity of light in vacuum – write true or false.

Ans: False.

2.11 What will be the change in mass number of a nucleus, if it emits one β – particle?

Ans: **The mass number remains same.**

2.12 Which compound can conduct electrically – electrovalent or covalent?

Ans: **Electrovalent**

2.13 H_2S reacts with $AgNO_3$ solution to give _____ precipitate.

Ans: **Ag_2S**

2.14 What is thermite mixture?

Ans: **Mixture of Fe_2O_3 and Al powder**

2.15 What is the monomer of PVC?

Ans: **Vinyl chloride**

2.16 Who proposed the tetrahedral model of carbon compounds?

Ans: **La Bel and Vant Hoff**

2.17 What is denatured spirit?

Ans: **To make unsuitable for drinking 10% methyl alcohol along with pyridine naphtha colouring matter are added to rectified spirit, is called methylated or denatured spirit.**

2.18 Name the electrolyte used for silver coating.

Ans: **sodium or potassium argentocynide solution.**

2.19 Mention the limitation of octet rule in covalent bond formation.

Ans: **Stability of molecules with odd number of electrons cannot be explained.**

2.20 State Dobereiner's law of triads.

Ans: **When elements are arranged in order of increasing atomic masses, group of three elements are obtained, which have similar chemical properties, and the atomic weight of the middle element is app**

2.21 What is gilding?

Ans: **Gilding is a decorative technique for applying a very thin coating of gold on solid surfaces, by electroplating.**

Group-C

3. Answer the following questions.

2x9 =18

(3.1) Find the percentage composition of magnesium in magnesium carbonate? (Mg =24, C=12, O=16)

Ans: Molecular weight of Magnesium carbonate = $24+12+16 \times 3 = 84$

Therefore % composition of Magnesium in magnesium carbonate is : $(24/84) \times 100 = 28.57\%$

(3.2) Convert 0.5atm to torr.

Ans: 1 atm =760 torr

therefore, 0.5 torr = $0.5 \times 760 = 760$ torr.

OR

Calculate the volume occupied by 5.6g of N_2 at STP (N=14).

Ans: 1 mole of $N_2 = 2 \times 14 = 28$ g

Thus, 28 g of N_2 will occupy 22.4 lit of volume

Therefore, 5.6g of N_2 at STP will occupy $22.4 \times 5.6/28 = 4.48$ lit of volume

(3.3) What is the cause of dispersion of light?

Ans: According to Snell's law, different colours have different refractive indices in a medium other than air or vacuum. Thus, for the same angle of incidence of white ray of light, there are different angles of refraction and hence the angular deviation is different for different colours. This gives rise to the phenomenon of dispersion of white light.

(3.4) Two wires of same material and same length have unequal radii respectively. Find out ratio of their resistances.

Ans: As R proportional to $1/A$, again $1/A$ is proportional to $1/\pi r^2$, so the resistances of the wires are:
 R_1 is proportional to $1/r_1^2$ and R_2 is proportional to $1/r_2^2$
Therefore, $R_1 : R_2 = r_2^2 : r_1^2$

(3.5) Calculate the safe limit of current for a bulb rated at 220V-100W.

Ans: using, $P=VI$

or, $I = P/V = 100/220 = 0.45 \text{ Amp.}$

(3.6) Define the term electronegativity

Ans: Ability of an atom to attract the shared electrons in a covalent bond towards itself.

OR

Which elements are called lanthanides? Arrange the elements in ascending order of metallic property: Al, Na, Mg, S, P

Ans: In the periodic table, period 6 contains 32 elements (Cs to Rn). Out of these, 14 elements (Ce to Lu) has been compressed. These elements are called lanthanides. They are rarely found in nature and hence also known as rare earth elements.

Ascending order of metallic property: $\text{Na} > \text{Mg} > \text{Al} > \text{P} > \text{S}$

(3.7) What are weak electrolytes? Give an example.

Ans: Compounds, which in aqueous solution state, are poor conductors of electricity and most of which remain as unionized molecules are called weak electrolytes. Ex: CH_3COOH .

(3.8) Mention the identification test for H_2S gas by the reaction with alkaline sodium nitroprusside solution.

Ans: When H_2S gas is passed through freshly prepared alkaline sodium nitroprusside solution (colourless), the solution becomes violet, due to formation of a complex salt. This is a useful identification test for H_2S .

OR

What happens when H_2S gas is passed through CuSO_4 solution?

Ans: When H_2S gas is passed through blue coloured CuSO_4 solution, black precipitate of copper sulphide (CuS) is formed.



(3.9) How ethylene can be converted into ethane?

Ans: When ethylene and hydrogen are passed over finely divided Ni catalyst at 200°C , the saturated hydrocarbon ethane is produced.



OR

How does acetylene take part in all the addition reactions?

Ans: Acetylene is an unsaturated hydrocarbon, it undergoes all the addition reactions. The addition takes place in two steps: first, the triple bond breaks into double bond and then to a single bond

GROUP -D

4. Answer the following questions (Alternatives are to be noted)

3×12

4.1 The volume of a fixed mass of gas at 20°C at 76mm of Hg pressure is 1000 cm^3 . At what temperature and at pressure of 750mm of Hg will the volume of the gas be 1400 cm^3 ?

Ans. 1atm = 760mm of mercury

Here $P_1 = (760/760) = 1 \text{ atm}$, $P_2 = (750/760) \text{ atm}$

$V_1 = 1 \text{ L}$, $V_2 = 1.4 \text{ L}$

$T_1 = (273 + 20) \text{ K} = 293 \text{ K}$

Let T_2 be the desired temperature

We know that $P_1 V_1 / T_1 = P_2 V_2 / T_2$

$T_2 = 404.8 \text{ K}$

4.2 6g of an impure sample of KClO_3 gave 1.9g of O_2 on heating in presence of a catalyst. What is the percentage purity of the KClO_3 sample?

Ans. $2\text{KClO}_3 = 3\text{O}_2 + 2\text{KCl}$

It is seen that 96g O_2 is obtained from 245.2 g KClO_3 .

So, 1.9g O₂ is obtained from $(245.2 \times 1.9)/96 = 4.853$ g of KClO₃

Now 6g of the sample contain 4.858 g of pure KClO₃.

So, its percentage purity = $(4.853 \times 100)/6 = 80.9$

OR

How much volume of carbon dioxide at N.T.P may be obtained from 1kg of calcium carbonate?

Ans. CaCO₃ = CaO + CO₂

It is seen from the above equation that 100g of CaCO₃ give 22.4 L of CO₂ at N.T.P

So 1kg CaCO₃ will give

$(22.4 \times 1000)/(100)$

= 224 L of CO₂ at N.T.P

4.3 Discuss about the factors on which the quantity of heat conducted through a solid bar depends?

Ans. a. Q is proportional to the area of cross-section of the bar,

b. Proportional to the ΔT between two ends,

c. Proportional to time in which the heat passes,

d. Inversely proportional to the length of the conductor.

OR

To maintain a steady flow of heat at the rate of 3000cal.sec⁻¹ through a metal plate with a cross section of 60cm² and thickness 0.5cm, what should be the temperature difference between its two faces .Given thermal conductivity of metal is 1.53cal.cm⁻¹.°C⁻¹.s⁻¹.

Ans. $Q/t = \Delta T/(l/KA)$

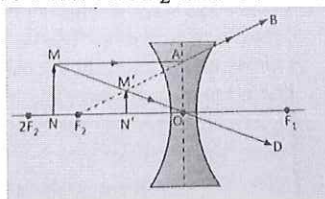
Now, $3000 = \Delta T/(0.5/1.53 \times 60)$

Or, $\Delta T = 16.34$ °C

4.4 Describe with a suitable ray diagram, formation of virtual, erect image by concave lens?

Ans. A concave lens always forms a virtual image of a real object, irrespective of its position from the lens. let us consider a situation when an object is situated at any finite distance from the optical centre according to diagram, say between F₂ and 2F₂.the image is virtual, erect and diminished in size.

It is situated on the same side of the object between F₂ and O. This type of image formation is utilized to



prepare spectacles for persons suffering from short sightedness.

4.5 Discuss briefly about the factors on which angle of deviation for a prism depend?

a) Depends on angle of incidence,

b) Depends on the angle of the prism (A),

c) The material of the prism or refractive index.

d) Colour of the light used.

4.6 An electric bulb draws a current of 0.5A for 1 hour. Calculate the amount of electric charge that flows through the circuit?

Ans. we know that $I = 0.5$ A, $I = Q/t$, $t = 1$ hr = (60×60) s = 3600s

$0.5 = Q/3600$

$Q = (0.5 \times 3600)$ C = 1800C

4.7 Calculate the heat energy produced when 96,000C of charge is transferred in two hours through a potential difference of 50V.

Ans. Current, $I = Q/t = 96000/(2 \times 60 \times 60) = 13.40$ A

From Ohm's law, $R = V/I = 50/13.40 = 3.73$ ohm

So heat produced, $H = I^2 R t = (13.40)^2 \times 3.73 \times (2 \times 60 \times 60) = 4822.3$ KJ

OR

Two bulbs are rated 220V-60W and 110V-60W respectively. Calculate the ratio of their resistances.

Ans. for the first bulb with rating 220V-60W, resistance, $R_1 = (220)^2/60$ Ohm

For the second bulb with rating 110V-60W, resistance, $R_2 = (110)^2/60$ Ohm

Hence $R_1 : R_2 = 4 : 1$

4.8 Calculate the mass defect in case of ⁷Li nucleus.[Given: actual mass of proton and neutron are 1.007277amu and 1.008665amu respectively. Actual mass of ⁷Li nucleus is 7.016005amu]

Ans. ⁷Li has 3 protons and 4 neutrons. So actual mass should be $[(3 \times 1.007277) + (4 \times 1.008665)]$ amu

= 7.0564491

But actual mass of ${}^7\text{Li}_3$ is 7.016005amu
 Mass defect = $(7.0564491 - 7.016005)\text{amu}$
 = 0.040486amu

OR

Compare α , β , γ rays according to their different properties.

Ans

Characteristics	α	β	γ
Charge	Positive	Negative	Uncharged
Mass	Helium nucleus, 4 times that of a proton	Same as an electron	No mass
Penetrating power	Very small	Higher than α	Highest

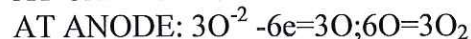
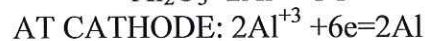
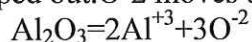
4.9 Briefly discuss about the position of hydrogen in the periodic table.

Ans. hydrogen is placed above the alkali metals. hydrogen and alkali metals all have 1e in their outermost shell. but hydrogen atom is very small and many of its properties are quite different from those of alkali metals. so while discussing the properties of alkali metals, H is never included. hydrogen has some resemblance with halogens. like hydrogen all the halogens are non metals. like halogens, hydrogen can accept electron to form hydride ion H^- . Due to this, some scientists prefer to assign hydrogen a separate place, at the head of the periodic table.

4.10 Discuss the extraction process of Al metal by electrolysis.

Ans. aluminium is obtained by electrolysis of mixture of pure alumina, cryolite and fluorspar at 1:3:1 ratio at 950°C . the electrolysis is carried out in an iron tank, the inner walls of which is coated with thick layer of carbon. this carbon coating acts as cathode. a set of hard carbon rods are suspended from the copper blocks into the iron tank, the carbon rods acts as anode.

At higher temperature (950°C) alumina is dissociated into Al^{+3} and O^{2-} . Al^{+3} moves towards cathode and produces alumina metal which is collected in the liquid state on the floors of iron tank from where it is trapped out. O^{2-} moves towards anode and finally oxygen gas is liberated at the anode.

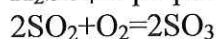


4.11 Discuss briefly the industrial manufacturing processes of : 1) HCl, 2) HNO_3 , 3) H_2SO_4 .

Ans. HCl is produced by passing a mixture of hot water vapour and chlorine through activated charcoal.

HNO_3 is prepared when mixture of ammonia gas in excess air is passed over a heated platinum gauze, it will oxidised to NO. NO is further oxidised in excess air NO_2 which then absorbed in water to give HNO_3 .

H_2SO_4 is prepared by contact process.

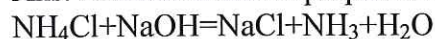


From SO_3 oilium is produced which is diluted with water to produce H_2SO_4 (1+1+1)

OR

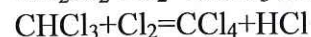
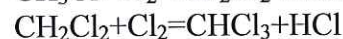
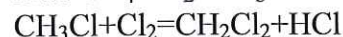
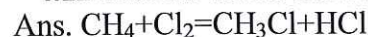
Discuss the laboratory synthesis procedure of NH_3 with relevant equations.

Ans. Ammonia can be prepared in laboratory by heating a dry ammonium salt with a dry alkali.



Ammonia gas is then collected by downward displacement of air because ammonia is lighter than air.

4.12 Discuss about the substitution reaction of methane with chlorine.



The above reaction can only be done in presence of diffused sunlight.

OR

What happens when ethanoic acid reacts with ethyl alcohol in presence of H_2SO_4 ?

Ans. This reaction is the identification test for carboxylic acid known as esterification reaction.

