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St. Lawrence High School
A JESUIT CHRISTIAN MINORITY INSTITUTION
Annual Examination – 2019

Sub: Physical Science	**Class 9**	**FM: 75**
Duration 2 hr 30 min	**Solution**	**Date 18.11.2019**

Group A

MCQ: **[1 x 13 =13]**

1.1 Light year is a unit of:
(a)Time (b) Mass
(c) Distance (d) None

1.2 The slope of a distance time graph is:
(a)Velocity (b) Acceleration
(c) Displacement **(d) Speed**

1.3 S.I. unit of pressure is:
(a) pascal (b) $kgfm^{-2}$
(c) atmosphere (d) None of these

1.4 Which will not diffuse?
(a) Suspension (b) True Solution
(c) Colloids (d) None of these

1.5 Which of the following solvents is used to remove nail polish?
(a) Ethyl Alcohol (b) Methyl alcohol
(c) Acetone (d) Turpentine oil

1.6 Which of the following substances change the colour of pH paper to greenish blue?
(a) Common salt (b) Vinegar
(c) An Antacid (d) Orange Juice

1.7 Mixture of carbon tetrachloride and water are separated using:
(a) Funnel **(b) Separating Funnel**
(c) Beaker (d) Fractionating Column

1.8 What is the prescribed limit of pH of potable water?
(a) 4.5 **(b) 6.5-8.5**
(c) 1.5-4.5 (d) 8.5-9.5

1.9 The kinetic energy of an object is K. If its mass is reduced to half, then its kinetic energy will be:
(a) K (b) 2K
(c) K/2 (d) K/4

1.10 The value of mechanical equivalent of heat (in erg/calorie) is:
(a) 4.2×10^{-7} **(b) 4.2×10^{7}**
(c) $1/4.2 \times 10^{7}$ (d) 4.2

1.11 Saturated vapour obeys:
(a) Boyle's Law (b) Charles' Law
(c) Pressure Law **(d) None of these Laws**

1.12 Distance between a compression and the adjoining rarefaction:
(a) $\lambda/4$ **(b) $\lambda/2$**
(c) λ (d) 2λ

1.13 Infrasound can be heard by
(a) Bat **(b) Rhinoceros**
(c) Dolphins (d) Human Beings

Group B

Answer all the Questions: **[1 x 16 =16]**

2.1 Name two different systems of units.
Ans: Two systems of units are: (any two)

- SI System
- CGS System
- MKS System
- FPS System

2.2 Is parsec a unit of time?
Ans: No, Parsec is a unit of distance.

2.3 What do we measure with a common balance?
Ans: We measure the mass of an body with the help of a common balance.

2.4 Define 1 newton.
Ans: One newton is the force which when applied on a body of mass 1 Kg produces an acceleration of 1 m/s^2.

2.5 State Newton's Second Law of Motion.
Ans: The rate of change of momentum of a body is directly proportional to the external unbalanced force applied on it and the change takes place in the direction of the applied force.

2.6 Define viscosity.
Ans: The property by virtue of which retarding forces are developed within a fluid when there is any relative motion between its parts is called viscosity of the fluid and it differs in degree from one fluid to another.

2.7 What is Young's modulus?
Ans: Young's modulus is defined as the ration of longitudinal stress and longitudinal strain within the elastic limit experienced by a material.

2.8 Why do not the forces of action and reaction cancel each other?
Ans: Action and reaction forces act on different bodies and so do not cancel each other out.

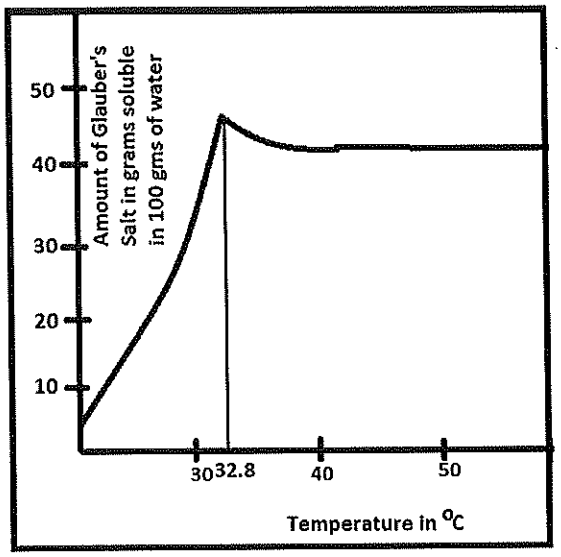
2.9 Glycerol is distilled under reduced pressure to avoid **decomposition.**

2.10 State whether true or false: Power of an agent depends only on the total work done.
False

2.11. Give the relationship between mole and Avogadro's number.
Ans. One mole of a substance contains Avogadro number of molecules in it.

2.12. Draw solubility curve of Glauber's salt.

Ans:



2.13 Give one industrial use of HCl.
Ans: Industrial uses of Hydrochloric acid include: (any one)

- As a pickling agent to remove scales from the surface of iron and steel made articles before galvanization
- For tanning leather
- Manufacture of Gelatine from bones
- In textile dyeing industry

2.14 Match the following:
2.14.1 The physical quantity transferred by a wave - (c) energy
2.14.2 Mass of the body x specific heat - (a) water equivalent
2.14.3 When force is applied on a body it produces - (b) acceleration

Group C

Answer all the Questions: **[2 x 8 =16]**

3.1 Find the dimension of velocity and acceleration.
Ans: Velocity = Distance [L] / Time [T] = $[LT^{-1}]$
Acceleration = Velocity $[LT^{-1}]$/ Time [T] = $[LT^{-2}]$

3.2 State the Law of parallelogram of forces.
Ans: If two forces acting on a particle at the same time be represented in magnitude and direction by the two adjacent sides of a parallelogram drawn from a point their resultant is represented in magnitude and direction by the diagonal of the parallelogram drawn from the same point.

3.3 State two factors affecting the surface tension of a liquid.
Ans: Two factors affecting the surface tension of a liquid are:

- Presence of impurities
- Temperature
-

3.4 Why is it dangerous to jump out of a moving bus?
Ans: It is dangerous to jump out of a moving bus because the body is in a state of motion. When the passenger touches the ground the feet attain rest but due to the inertia of motion the

body moves forward and may result in the passenger falling forward. The rate of change of momentum in that instance gives the impulse of the force which being high may lead to serious injury.

3.5 Why are chemical properties of isotopes identical?
Ans: As the isotopes contain the same number of protons and electrons so the chemical properties of isotopes are identical.

3.6 What happens when nitric acid vapours are passed over hot copper powder?
Ans: Nitric acid vapour when passed over hot copper powder, produce black copper oxide along with the evolution of Nitrogen gas.
$5Cu + 2HNO_3 \rightarrow 5CuO + H_2O + N_2\uparrow$

3.7 What happens when zinc reacts with hot concentrated caustic soda?
Ans: Zinc reacts with hot and concentrated caustic soda or sodium hydroxide yielding sodium zincate with the evolution of hydrogen gas.
$Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2\uparrow$

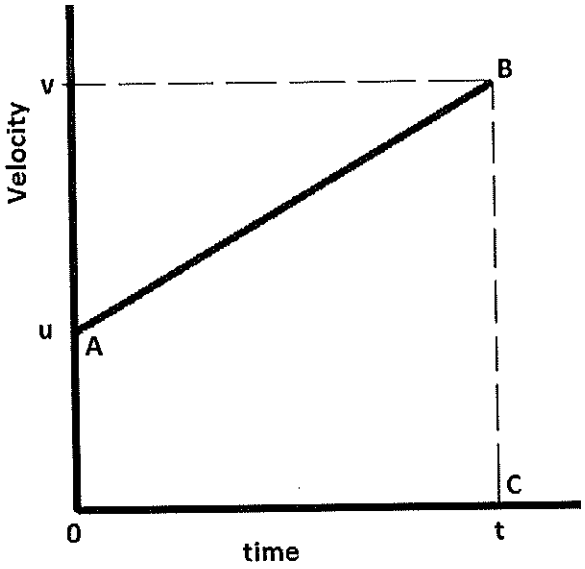
3.8 State Bernoulli's Theorem.
Ans: For the streamline flow of an ideal liquid the total energy (i.e. the sum of the pressure energy, potential energy and kinetic energy) per unit mass remains constant at every cross section throughout the liquid flow.

$$\frac{p}{\rho} + gh + \frac{1}{2}v^2 = \text{a constant}$$

Group D

Answer the following Questions(any ten): **[3 x 10 =30]**

4.1 Prove graphically the equation of motion $s = ut + \frac{1}{2}at^2$.



Ans: Alongside we have a velocity time graph of a body moving with constant acceleration. We know that the Displacement (S) = Area under the curve = Area of trapezium OABC = ½ x(OA + BC) x OC
Or S = ½ x (u + v) x t (i)
Now from the slope of the curve
Acceleration (a) = (v-u) /t
Or v= u + at (ii)
Replacing (ii) in (i) we have:
S= ½ x (u + u + at) x t
= ½ x (2u + at) x t
= ½ x ($2ut + at^2$)
= $ut + \frac{1}{2}at^2$
Hence proved.

4.2 When a force acts on a body of mass 10 g initially at rest, it acquires a velocity of 15 m/s in 5 s. Find the acceleration, final momentum of the body and the magnitude of the force.
Ans: Mass (m) = 10 g = 0.01 Kg
Initial velocity (u) = 0 m/s
Final velocity (v) = 15 m/s
Time (t) =5 s

Acceleration (a) = (v-u) /t = 3 m/s^2
Final momentum = mv = 0.15 Kgm/s
Force = ma= 0.03 N

4.3 One end of an iron wire of length 250 cm and of diameter 1 mm is rigidly fixed with a beam and a weight of 8 Kg is placed at the other end. Calculate the elongation of the wire. Y of iron = 20 x 10^{11} $dyne/cm^2$; g= 980 $dyne/cm^2$
Ans: From the definition of Young's modulus(Y):
Y= longitudinal stress / longitudinal strain.
Longitudinal stress (σ) = Force (F) / cross sectional area (A)
Longitudinal strain (ε)= elongation (Δl)/ original length (l)
Or $Y = \frac{F/A}{\Delta l/l}$
Or, Δl= Fl/AY
$A = \pi d^2/4$
Or Δl= $4Fl/\pi d^2Y$ = 1.25 x 10^{-3} cm (2dp) = 1.25 x 10^{-5} m

4.4 State Bohr's postulates of atomic model to eliminate the defects of Rutherfors's atomic model.

Ans: Postulates of the Bohr Atomic Model

- Electrons revolve around the nucleus in a fixed circular path termed "orbits" or "shells" or "energy level."
- The orbits are termed as "stationary orbit."
- Every circular orbit will have a certain amount of fixed energy and these circular orbits were termed orbital shells. The electrons will not radiate energy as long as they continue to revolve around the nucleus in the fixed orbital shells.
- The different energy levels are denoted by integers such as n=1 or n=2 or n=3 and so on. These are called as quantum numbers. The range of quantum number may vary and begin from the lowest energy level (nucleus side n=1) to highest energy level.
- The different energy levels or orbits are represented in two ways such as 1, 2, 3, 4... or K, L, M, N..... shells. The lowest energy level of the electron is called the ground state.
- The change in energy occurs when the electrons jump from one energy level to other. In an atom, the electrons move from lower to higher energy level by acquiring the required energy. However, when an electron loses energy it moves from higher to lower energy level.

4.5 What is the molar concentration of a 10% NaOH solution?
Ans: 10% (w/v) NaOH refers to 10 g NaOH in 100 ml of water
Molar mass of NaOH = 23 + 16 + 1 = 40g
Formula for finding molarity = Number of moles/Volume of solution in litres
= Given mass/ Molar mass * 1000/Volume of solution in ml
= 10/40 * 1000/100
= 10/4
= 2.5 M
Therefore, molarity = 2.5M

4.6 Write a note on stone leprosy.
Ans: Due to atmospheric pollution rainfall is made so acidic which causes harm to the environment and the main cause is due to industrial burning of fuels that contain sulphur and nitrogen oxides which combine with water and form the acid. Due to the formation of $CaSO_4$ or $Ca(NO_3)_2$ the marble stones of historical monuments become dull and the brightness is lost. The top layer of the stone is corroded, small holes are created and the bright layer of marble stone is destroyed. Such type of pitting, discolouration, deformation and destruction of acid rain as a consequence of air pollution is called as stone leprosy.
$CaCO_3 + H_2SO_4 = CaSO_4 + CO_2 + H_2O$
$CaCO_3 + 2\ HNO_3 = Ca(NO_3)_2 + CO_2 + H_2O$

4.7 What are the limitations of chlorination to disinfect drinking water?
Ans: The limitations of Chlorination to disinfect drinking water are as follows:
a. Giardia and cryptosporidium are generally resistant to chlorine unless it is used in higher doses than those generally preferred for treatment.
b. The residual chlorine in water imparts unpleasant taste in the treated water.
c. Presence of too much residual chlorine may produce chemical by-products with organic matter in water, some of which are carcinogenic.

4.8 How does soap behave with (a) soft water (b) hard water?
Ans: Soft water: Water which produces good lather with soap is called soft water. When water falls as rain, it is naturally soft. Washing with soap is easy in soft water.

Hard water: Water which does not produce good lather with soap is called hard water. It is difficult to wash with soap in hard water. Water seeping through the ground becomes hard water. It is not useful for laundry and laboratory purposes.

Although soap is a good cleaning agent, its cleaning capacity is reduced when used in hard water. Hardness of water is due to the presence of sulphates, chlorides or bicarbonate salts of Ca2+ or Mg2+ ions. Soaps are sodium or potassium salts of long chain fatty acids. When soap is added to hard water, the Ca2+ and Mg2+ ions present in hard water react with soap. The sodium salts present in soaps are converted to their corresponding calcium and magnesium salts which are precipitated as scum. The insoluble scum sticks on the clothes and so the cleaning capacity of soap is reduced.

The cleaning action of soap is very effective in soft water because it contains negligible calcium and magnesium ions.

4.9 6.4 kJ of energy causes a displacement of 64 m in a body in the direction of the force in 2.5 s. Calculate (i) the force applied (ii) power in horse power
Ans: Energy (E) = Work done (W)= Force (F)x displacement in the direction of the force(S)
So, Force = W/S= 6.4 x 1000/ 64 N = 100 N
Time (t) = 2.5 s
Power = W/t = 6400/2.5 W= 2560 W = 2560/746 h. P. = 3.43 h. P. (2dp)

4.10 A piece of iron of mass 2 kg has a thermal capacity of 966 J/°C. (i) How much heat is needed to warm it by 15 °C? (ii) What is its specific heat capacity in SI units?
Ans: Mass (m) = 2 Kg
Thermal capacity (C)= 966 J/°C
Change in temperature (T) = 15 °C.
(i) Heat required = CT= 966 x 15 J = 14490 J
(ii) Specific heat capacity (c) = C/m = 966 /2 J/Kg/K= 483 J/Kg/K

4.11 What are the conditions for the formation of an echo?
Ans: To produce an echo the conditions required are:
a. There should be a sufficient time gap between original and reflected sounds. So, if we want to hear distinct echo the reflected sound must reach the ear 0.1 s after the direct original sound
b. The distance between the source of sound and the obstacle should be sufficient. An echo will be heard distinctly if the minimum distance between the source of sound and the obstacle is 340/2 = 17 m.
c. Nature of the obstacle plays an important role. For the formation of echo the reflecting surface must be rigid such as a building, hill or a cliff.
d. Size of the obstacle should be quite large for the echoes to be heard.