



# ST. LAWRENCE HIGH SCHOOL

## Answer Key Annual Exam – 2018

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Sub: Physical science  
Duration: 2hrs 30 min

Class: IX

F. M. : 75  
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### GROUP-A

1. Answer the following questions (Multiple Choice Question)

(1×10=10)

(1.1) The dimension of power is:

- (a)  $[ML^2T^{-3}]$ , (b)  $[MLT^2]$ ,  
(c)  $[M^2LT^{-1}]$ , (d)  $[M^3LT^2]$ .

(1.2) Alcohol and water mixture can be separated by:

- (a) Distillation, (b) Filtration, (c) **Fractional distillation**, (d) Decantation.

(1.3) Velocity of sound in dry air at 0°C is:

- (a) 233m/s, (b) 330m/s, (c) **332m/s**, (d) 450m/s.

(1.4) Which is not a vector among the following:

- (a) **Buoyancy**, (b) Deforming force, (c) Lateral thrust, (d) Acceleration.

(1.5) Permissible limit for fluoride in water is:

- (a) **1mg/L**, (b) 5mg/L, (c) 3mg/L, (d) 9mg/L.

(1.6) If you soak a PH paper into gastric juice, it will indicate a PH-

- (a) more than 7, (b) **less than 7**, (c) equal to 7, (d) less than 1.

(1.7) Calorimetry relates to the measurement of –

- (a) **heat**, (b) temperature, (c) mechanical energy, (d) none of these.

(1.8) One Mole of a substance means –

- (a) a molecule of the substance, (b) a number of molecules of the substance, (c) a number of atoms of the substance, (d) **Avogadro number of molecules/atoms of the substance**.

(1.9) Which one is the true solution?

- (a) **solution of common salt**, (b) Solution of chalk, (c) milk, (d) butter

(1.10) The distance travelled by a wave in one second is:

- (a) Wavelength (b) **Velocity** (c) time period (d) frequency

## GROUP-B

Answer the following question :

1 x 22 = 22

1. What is parsec ?

Ans: A unit of distance used in astronomy, 1 parsec = 3.26 light year

2. Name the principal on which a rocket works .

Ans: Conservation of linear momentum / Newton's third law of motion.

3. What is the value of normal atmospheric pressure ?

Ans: 76 cm of Hg column/ 1 atm/  $1.303 \times 10^5$  Pa

4. Cathode rays are composed of what ?

Ans: Negatively charged particle / electrons.

5. When a body moves with retardation, then it has negative kinetic energy—Write True or False.

Ans: False

6. What is the electronic configuration of sodium atom ?

Ans: 2,8,1 (or with diagram)

7. What is the value of Avogadro's number ?

Ans:  $6.022 \times 10^{23}$

8. Is soda water a homogeneous or heterogeneous mixture ?

Ans: Homogeneous mixture

9. Will milk can show Tyndal effect ?

Ans: Yes

10. Name two common emulsifying agents ?

Ans: Gelatin, soap (or any other)

11. Give one example of retardation.

Ans: A ball thrown upward against gravity, stopping a moving ball.

12. State the relationship between thrust and pressure .

Ans: Pressure = Thrust / Area

13. On what principle Bernoulli's theorem is based ?

Ans: Conservation of energy

14. The chemical properties of isotopes are identical. Why ?

Ans: Same electronic configuration / Same atomic number

15. What is a mole ?

Ans: The amount of substance that contains as many elementary entities as there are atoms in 0.012 kg of  $C^{12}$  or 1 g molecule of carbon.

16. Why is a little amount of gelatin added during the preparation of ice-cream ?

Ans: To make it soft, fresh and smooth, to prevent formation of water crystals.

17. What do you mean by stationary orbits ?

Ans: The orbits in which the electrons revolve around the nucleus are said to be stationary orbits having definite energy.

18. What is a watt ?

Ans: SI unit of power / 1 J of work done by a body in 1 s.

19. What is the source of arsenic pollution in water ?

Ans: Arsenite salts.

20. Define specific heat .

Ans: The amount of heat required to raise the temperature of unit mass of a substance by  $1^\circ C$ .

21. How much joule is 1 calorie ?

Ans: 1 cal = 4.186 J / 4.2 J

22. What is reverberation ?

Ans: Multiple reflection of sound.

## GROUP-C

3. Answer the following questions.

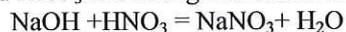
$2 \times 9 = 18$

(3.1) What is eutrophication?

Ans: Nitrogen and phosphorus of fertilizers may accumulate in lakes and ponds with off water. These nutrients enhance growth of algae causing depletion of oxygen dissolved in water. This reduction of oxygen level in water is called eutrophication, which affects population of fish and other aquatic animals.

(3.2) What happens when NaOH reacts with (a)  $HNO_3$  (b) Al? Give the relevant chemical equations.

Ans: (a) Nitric acid  $HNO_3$  is a strong monobasic acid, it combines with NaOH to form salt and water.



(b) Aluminium (Al) reacts with hot caustic soda or sodium hydroxide solution with the formation of sodium aluminate salt and evolution of hydrogen.



(3.3) Write briefly about the superincumbent pressure on the liquid.

Ans: When vapour pressure of liquid becomes equal to the atmospheric pressure, the liquid starts to boil. Thus, boiling point of liquid depends upon the superincumbent pressure on the liquid. Boiling point of water increases or decreases by  $1^\circ C$  with the increase or decrease of atmospheric pressure by about 27 mm near normal pressure.

(3.4) Write down the use of a fractionating column.

Ans: In case of liquids having close boiling points, both the liquids will tend to distill in different proportions and hence the fractions have to be distilled separately. This can be avoided by using a fractionating column which gives the effect of repeated distillation by offering resistance to the passage of vapours.

(3.5) A cricket ball of mass 100g moves with a velocity 20m/s. A batsman stops the ball in 0.05s. Find the force applied.

Ans : Retardation =  $(0-20)/0.05 = -400\text{m/s}^2$

Mass of the ball 100g = 0.1kg

Hence, force applied =  $0.1\text{kg} \times 400\text{m/s}^2 = 40\text{N}$

(3.6) Calculate the number of particles in 11g of  $\text{CO}_2$ .

Ans : Number of particles is  $(11/44) \times 6.022 \times 10^{23} = 1.5055 \times 10^{23}$

(3.7) At  $20^\circ\text{C}$ , the solubility of NaCl is 36. At this temperature in a saturated solution of the salt 400g water is present. What amount of salt is obtained on evaporation of the solution?

Ans : Mass of solvent = 400g, solubility = 36

So, solubility =  $(\text{wt of solute} / \text{wt of solvent}) \times 100 = (\text{wt of solute} / 400) \times 100 = 36$

or, wt of solute =  $400 \times 36 / 100 = 144\text{g}$

(3.8) Explain why an iron ball sinks in water while a ship made of iron floats on water,?

Ans: The upward buoyant force on the iron ball is equal to the weight of the water of the ball displaces. But since the ball is of small volume, it displaces small quantity of water. So, the buoyant force is too small to balance the weight of the ball acting downward, hence the ball sinks. Whereas the ship displaces a huge quantity of water due to the bulged shape of its lower part. The upward buoyant force, equal to the weight of the displaced water, is enormous and can easily balance the weight of the ship. So, the ship floats.

(3.9) What are the harmful effects of water pollution?

Ans : (i) Fluoride dissolved in water is responsible for fluorosis disease.

(ii) Arsenic dissolved in water is carcinogenic in nature and causes discoloration of skin, paralysis etc. ( Or any other two harmful effects

### Group – D

I. Answer the following question.

- 4.1 a) Arrange in descending order of magnitude – angstrom, femtometre, micron, nanometer. (1+2+2)  
b) A particle moves 10m due east in 2 sec and then 15m due north in 4 sec. find the average speed and velocity.  
c) what is the velocity of a body after 30sec if it moves from rest with the acceleration  $20\text{cm/s}^2$ .

Ans:

a) micron – nanometer – angstrom – femtometre.

b) Distance travelled =  $(10 + 15)\text{m} = 25\text{m}$ . And time taken =  $(2+4)\text{ sec} = 6\text{ sec}$ .

So average speed =  $\frac{25}{6}\text{ m/sec} = 4.17\text{ m/sec}$

Displacement =  $\sqrt{10^2 + 15^2} = 5\sqrt{13}\text{ m}$

So the velocity =  $\frac{5\sqrt{13}}{6}\text{ m/sec}$

c) Given,  $u = 0$ ,  $t = 30\text{ sec}$ ,  $a = 20\text{cm/s}^2$

So, using,  $v = u + at$ , we get

$v = 0 + (20 \times 30)\text{ cm / sec} = 600\text{ cm / sec}$ .

4.2 a) Is light year a fundamental unit or derived unit? (1+2+2)

b) why it is easier to accelerate a moving vehicle by push than one at rest? .

c) why can not athlete stops instantaneously when he reaches the end after the race?

Ans:

a) Derived unit.

b) Moving vehicle possesses inertia of motion. As inertia is the inherent tendency of a body to continue its own state of motion, so the body tries to be in motion. So while accelerating the body the body will not oppose the external applied force.

But if the body be at rest initially, then it possesses inertia of rest, hence it tries to oppose the applied force.

c) As inertia is the inherent tendency of a body to continue its own state of motion, so the the athlete tries to be in motion and cannot stop instantaneously.

4.3 a) A solid weighs 150 g in air and 120g in water. Calculate its volume and density. (3+2)

b) The ratio of radii of two wires of same material is 3:4. If the wires are stretched by equal force, find the ratio of stress.

Ans: a) The apparent loss of weight of the body when immersed in water is =  $(150-120) \times 980\text{ dyne} = 30 \times 980\text{ dyne}$ .  
So, the weight of the water displaced =  $30 \times 980\text{ dyne}$  [ by Archimedes' principle]

So the mass of the water displaced =  $\frac{30 \times 980}{980}\text{ g} = 30\text{ g}$

So the volume of the water displaced =  $\frac{\text{mass of the water}}{\text{density of water}} = \frac{30}{1} = 30\text{ cc}$

So the volume of the body = volume of the water displaced = 30 cc

And the density of the body =  $\frac{\text{mass of the body}}{\text{volume of the body}} = \frac{150}{30} = 5\text{ g/cc}$

b) let the radii are  $3x$  and  $4x$ . And the applied force is F.

so the stress is 1<sup>st</sup> wire is =  $\frac{F}{\pi (3x)^2} = \frac{F}{9\pi x^2}$

and, the stress is  $2^{\text{nd}}$  wire is  $= \frac{F}{\pi (4x)^2} = \frac{F}{16\pi x^2}$

so the ratio of stress  $= \frac{F}{9\pi x^2} : \frac{F}{16\pi x^2} = \frac{1}{9} : \frac{1}{16} = 16:9$

**4.4a) Two persons of corresponding masses 50kg and 40 kg climb 10m above the ground. the first took 5 minute to do this and the second 4minute. how much work did each do and what are their powers?**

Ans. Work done by 1<sup>st</sup> person =  $mgh = (50 \times 10 \times 10) = 5000\text{J}$

Power of the 1<sup>st</sup> person =  $(\text{work})/(\text{time}) = (5000/300) = 16.66\text{watt}$

Work done by second person =  $(40 \times 10 \times 10)\text{J} = 4000\text{J}$

Power of the 2<sup>nd</sup> person =  $(4000/240) = 16.66\text{watt}$

**b) How fast should a man of mass 60kg run so that his kinetic energy is 750J?**

ans. Mass = 60kg, kinetic energy = 750J

kinetic energy =  $(1/2)mv^2$

$750\text{J} = (1/2)60 \times v^2$

$v = 5\text{ms}^{-1}$

**4.5a) how much heat should be supplied to 2g ice at  $0^{\circ}\text{C}$  to convert it to 2g water at  $0^{\circ}\text{C}$ ? latent heat of fusion of ice =  $80\text{calg}^{-1}$ .**

**b) what is the melting point of substance? is the freezing point of a substance same as its melting point?**

Ans. a) heat =  $m \times l$  [m = mass of the substance, l = latent heat of fusion of ice]

$= (2 \times 80)\text{cal}$

$= 160\text{cal}$

b) The temperature at which a solid melts to liquid, and solid liquid phase of the substance are in an equilibrium at a specified pressure. Is known as melting point of that substance.

Yes, for most of the substances freezing point and melting points are same.

**4.6a) How  $\text{HNO}_3$  acid can be identified by ring test? (3+2)**

**b) why water is called a universal solvent?**

Ans. a) freshly prepared  $\text{FeSO}_4$  solution is added to little amount of  $\text{HNO}_3$ . concentrated  $\text{H}_2\text{SO}_4$  is taken in another test tube and carefully poured into the liq mixture by side of the test tube so as to form a heavy layer at the bottom of the test tube. a brown ring is formed at the junction of the two liquid, which proves the presence of  $\text{HNO}_3$  in the test tube.

$6\text{FeSO}_4 + 2\text{HNO}_3 + 2\text{H}_2\text{SO}_4 = 3\text{Fe}_2(\text{SO}_4)_3 + 4\text{H}_2\text{O} + \text{NO}$

$\text{FeSO}_4 + \text{NO} + 5\text{H}_2\text{O} = \text{Fe}[(\text{H}_2\text{O})_5\text{NO}]\text{SO}_4$

b) Both the inorganic and organic compounds are soluble in water. water can dissolve inorganic compounds, as the ionic compounds get dissociated in water and the ions get attracted by the  $\text{H}^+$  AND  $\text{OH}^-$  ions by electrostatic force of attraction, whereas covalent compounds like sugar, urea can also get dissolved. so water is called universal solvent.

**4.7) a) How does the boiling point of a liquid depend on pressure? (1+2+2)**

**b) Explain fractional distillation.**

**c) Name two commercial materials obtained from fractional distillation of crude petroleum.**

Ans. a) Boiling point of a liquid is directly proportional to pressure, where the atmospheric pressure is much lower, the boiling point is also lower. boiling point increases with increasing pressure.

b) the process of separation of two or more miscible liquids by distillation by making use of the difference in their boiling points is called fractional distillation. This process is used for the separation and purification of mixture of two miscible liquids in which the boiling points of the components differ by about  $15^{\circ}\text{C}$  to  $20^{\circ}\text{C}$ .

c) petroleum ether, kerosene oil