PHYSICS

We absorb a lot more information if we learn in small, manageable portions, instead of trying to learn everything at once.
Break it down! Study small sections, take a break, then study again.

PHYSICS 2005/06 QUESTIONS

1. Which of the following represents the correct precision if the length of a piece of wire is measured with a meter rule?
   A. 35mm
   B. 35.0mm
   C. 35.00mm
   D. 35.01mm

2. To keep a vehicle moving at a constant speed V requires power P, from the engine. The force provided by the engine is
   A. P/V
   B. $V/2$
   C. PV
   D. P/V^2

3. Which of the following statements give the TRUE difference between evaporation and boiling?
   i. Evaporation occurs at all temperatures while boiling occurs at a fixed temperature for a given pressure
   ii. Evaporation is a surface phenomenon while boiling is an interior phenomenon
   iii. Evaporation is affected by surface area while boiling is not
   A. i and ii only
   B. i and iii only
   C. ii and iii only
   D. i, ii and iii only

4. Equal masses of copper and rubber are raised to the same temperature. After sometime, the copper was observed to be at a lower temperature because
   A. the specific heat capacity of copper is lower than that of rubber.
   B. copper expands more than rubber.
   C. the specific heat capacity of rubber is lower than that of copper.
   D. rubber expands more than copper.

5. Which of the following statements is correct about a long-sighted boy who does not put on glasses?
   A. He cannot see distant objects clearly
   B. Rays of light from a close object are focused in front of the retina
   C. His eyeball is too long
   D. Parallel rays of light are focused behind the retina

6. A 12V battery has an internal resistance of 0.5Ω. If a cable of 1.0Ω resistance is connected across the terminals of the battery, the current drawn from the battery is
   A. 16.0A
   B. 8.0A
   C. 0.8A
   D. 0.4A

7. If two parallel wires carry currents flowing in the same direction, the conductors will
   A. attract each other
   B. repel each other
   C. both move in the same direction
   D. have no effect on each other

8. From the generating station to each sub-station, power is transmitted at a very high voltage so as to reduce
   A. eddy current loss
   B. hysteresis loss
   C. heating in the cables
   D. magnetic flux leakage

9. Two tuning forks of frequencies 256Hz and 260Hz are sounded close to each

other. What is the frequency of the beats produced?

A. 516Hz B. 258Hz
C. 4Hz D. 300Hz

10. The fundamental frequency of vibration of a sonometer wire may be halved by
A. doubling the length of the wire
B. doubling the mass of the wire
C. reducing the tension by half
D. reducing the absolute temperature by half

11. A transformer has a primary coil with 500 turns and a secondary coil with 2500 turns. When the voltage input to the primary is 120V, the output is
A. 6000V
B. 600V
C. 240V
D. 60V

12. The principle of operation of an induction coil is based on
A. Ohm's law
B. Ampere's law
C. Faraday's law
D. Coulomb's law

13. 4g of radioactive material of half-life 10days is spilled on a laboratory floor. How long would it take to disintegrate 3.5g of the material?
A. 11/4 days
B. 8 ¾ days
C. 30 days
D. 80 days

14. Which of the following statements correctly describe(s) cathode rays?
I. They consist of tiny particles carrying negative electric charges
II. They are deflected in a magnetic field but not in an electric field
III. They consist of fast moving neutrons and are deflected in an electric field
A. i only
B. iii only
C. i and ii only
D. ii and iii only

15. Which of the following is most strongly deflected by a magnetic field?
A. γ-rays
B. α-rays
C. β-particles
D. X-rays

SUCCESS QUOTE

Push yourself to do more and to experience more. Harness your energy to start expanding your dreams. Yes, expand your dreams. Don't accept a life of mediocrity when you hold such infinite potential within the fortress of your mind. Dare to tap into your greatness. It's your birthright.

~ Robin Sharma

PHYSICS 2005/2006 ANSWERS

1. The least count of a measuring device is the smallest measurement which the measuring device can be used to measure. It is otherwise referred to as reading accuracy.
   For meter rule, the
   reading accuracy/precision = 0.1cm
   = 1.0mm.
   Therefore, 35.0mm represents the correct precision of the measured length.
   Ans. B

2. Speed = v, power = P, distance = S, force = F, time = t, work done = W.
   $P = W/t = (F \times S)/t \rightarrow P = F \times S/t = F \times v$
   $\rightarrow P = Fv$ and $F = P/v$ **Ans. A**

3. Notice that statement (ii) looks true but it's not. While evaporation simply takes place at the surface of the liquid, boiling takes place in all parts of the liquid
   Ans. B

4. Specific heat capacity is defined as the amount of heat that is necessary to raise the temperature of a unit mass of a substance through 1°C. A body with low specific heat capacity can get heated quickly and can equally lose that heat quickly. **Ans. A**

5. A long-sighted person can see objects at a distance but cannot see close objects clearly. Long-sightedness is caused by the eyeball being too short or the eye lens not being sufficiently convergent so that rays from an object are brought to focus behind the retina.
   Ans. D

6. $E = I(R+r)$
   $12 = I(0.5+1.0)=1.5I$
   $12 = 1.5I$
   $I = 12/1.5 = 8A$
   Ans. B

7. Ampere's law states that two parallel wires attract each other when the currents in them flow in the same direction, but repel each other when the currents flow in opposite directions. **Ans. A**

8. To reduce energy loss, electricity generated in power stations is raised to a very high voltage for transmission. A high transmission voltage means that only a relatively small current flows through the transmission cables. As you know, current produces heating effect when flowing through the cables with resistance. When the current used for transmission is small, energy loss due to heating effect on the cables is reduced, enabling more electrical power to be transferred to the users.
   Ans. C

9. Note that if you have only one tuning fork, no beat frequency is heard. A beat frequency is the result of combining two (or more) frequencies. The closer the two frequencies, the lower the beat

frequency, and this will become zero when they are perfectly in tune.

Beat frequency (f) = $f_2 - f_1$
= 260Hz - 256Hz
= 4Hz

Ans. C

10. For a sonometer, the relationship between f and l is an inversely proportional relationship; that is, if the length is doubled the frequency is halved, and if the octave (double frequency) is required the length is halved. **Ans. A**

11. $P_T/S_T = P_V/S_V$
$500/2500 = 120/x$
$\rightarrow x = (120 \times 2500)/500$
$= 600V$ **Ans. B**

12. The principle of operation of an induction coil is based on Faraday's law. Michael Faraday discovered the principle of induction (i.e. Faraday's induction law) in 1831 and did the first experiment with induction between coils of wire. **Ans. C**

13. Amount remaining = 4 - 3.5 = 0.5g
After 10days, ½ × 4g = 2g remains
After 20days, ½ × 2g = 1g remains
After 30days, ½ × 1g = 0.5g remains

Ans. C

14. Cathode rays (also called an electron beam) are streams of electrons (negatively charged particles) observed in vacuum tubes. They have the following properties:

(A.) Rectilinear propagation;
(B.) They cause fluorescence;
(C.) They posses kinetic energy which is changed to heat when they are brought to rest;
(D.) They can produce X-rays if they are of sufficiently high energy;
(E.) They are deflected by electric and magnetic fields, travelling in circles in magnetic fields at right angles to their motion and in parabolas in electric fields at right angles to their motion. **Ans. A**

15. Of all the options, β-particles is most strongly deflected by a magnetic field because it is very light and negatively charged. **Ans. C**

SUMMARY OF ANSWERS
[PHYSICS 2005/2006]

1.B	2.A	3.B	4.A	5.D
6.B	7.A	8.C	9.C	10.A
11.B	12.C	13.C	14.A	15.C

SUCCESS QUOTE

"Don't say you don't have enough time. You have exactly the same number of hours per day that were given to Helen Keller, Pasteur, Michelangelo, Mother Teresa, Leonardo Da Vinci, Thomas Jefferson, and Albert Einstein."

~ H Jackson Brown

PHYSICS 2006/07 QUESTIONS

Indicate the correct option in each of the following questions

1. Which of the following is a set of vectors?
   A. force, mass and momentum
   B. acceleration, velocity and momentum
   C. mass, weight and density
   D. mass, volume and density

2. A catapult used to hold a stone of mass 500g is extended by 20cm with an applied force, F. If the stone leaves with a velocity of 40m/s, the value of F is
   A. 4.0×10^2 N/m^2 B. 2.0×10^3 N
   C. 4.0×10^3 N D. 4.0×10^4 N

3. A parachute attains a terminal velocity when
   A. its density is equal to the density of air
   B. the viscous force of air and upthrust completely counteract its weight
   C. it expands as a result of reduced external pressure.
   D. the viscous force of the air is equal to the sum of the weight and upthrust

4. An electrical heater is used to melt a block of ice, mass 1.5kg. If the heater is powered by a 12V battery, and a current of 20A flows through the coil, calculate the time taken to melt the block of ice at 0°C. (specific latent heat of fusion of ice = 336×10^3J/kg)
   A. 76.0min B. 35.0min
   C. 21.0mn D. 2.9min

5. 200g of water at 90°C is mixed with same quantity of water at 30°C. What is the final temperature?
   A. 50°C B. 60°C
   C. 70°C D. 80°C

6. The equation $P^XV^YT^Z$ = constant is Charles law when
   A. x=1, y=1, z=1
   B. x=0, y=1, z=-1
   C. x=1, y=0, z=-1
   D. x=0, y=1, z=1

7. For a short-sighted person, light rays from a point on a very distant object is focused
   A. in front of the retina
   B. behind the retina
   C. behind the retina by a diverging lens
   D. in front of the retina a distance 2F from the lens

8. Dispersion of light by a glass prism is due to the
   A. different hidden colours of the glass
   B. different speeds of various colours in glass
   C. defect in the glass
   D. high density in glass

9. To produce an enlarged and erect image with a concave mirror, the object must be positioned
   A. between the principal focus and the centre of curvature
   B. at the principal focus
   C. between the principal focus and the pole
   D. beyond the centre of curvature

10. To convert an ac dynamo to dc dynamo, the
    A. number of turns of the coil is increased.
    B. slip rings are replaced with a split-ring commutator
    C. number of turns of the coil is reduced.
    D. split-ring commutator is replaced with slip rings.

11. In an AC circuit that contains only a capacitor, the voltage
    A. lags behind the current by 90°
    B. leads the current by 90°
    C. lags behinds the currents by 180°
    D. leads the current by 180°

12. The purpose of dielectric material in a parallel plate capacitor is to
    A. increase the capacitance.
    B. decrease its capacitance
    C. insulate the plates from each other
    D. increase the magnetic field between plates

13. A substance has a half-life of 3min. After 6mins, the count rate was observed to be 600. What was its count rate at zero time?
    A. 200 B. 1200
    C. 1600 D. 2400

14. If light with photon energy 2eV is incident on the surface of a metal with work function 3eV, then
    A. no electron will be emitted
    B. the few electrons emitted will have maximum kinetic energy of 1eV
    C. the few electrons emitted will have a maximum kinetic energy of 3eV
    D. many electrons will be emitted with maximum kinetic energy of 5eV

15. In a nuclear fusion experiment, the loss of mass amount to 1.0×10^{-6}kg. The amount of energy obtained from the fusion (speed of light=3.0×10^{8}m/s) is
    A. 3.0×10^{-4} J B. 3.0×10^{-4} J
    C. 9.0×10^{-4}J D. 9.0×10^{10} J

SUCCESS QUOTE

"If you want to succeed in your life, always remember this phrase: 'The past does not equal the future.' That you have sought admission for many years without success doesn't mean anything...All that matters is: What are you going to do, right now?"

~ Henry Divine

PHYSICS 2006/2007 ANSWERS

1. Vector quantities are quantities that have both magnitude and direction e.g. acceleration, velocity, momentum, etc.

Ans. B

2. m = 500g = 0.5kg, s = 20 = 0.2m,
v = 40m/s.
F = ma
To obtain the value of "a", we note that
$v^2=2as$
$40^2 = 2 \times a \times 0.2 = 0.4a$
$a = 40^2/0.4 = 4000 m/s^2$
F= 0.5 x 4000
$F = 2000 = 2 \times 10^3 N$

Ans. B

3. A parachute attains a terminal velocity when the viscous force of the air and the upthrust completely counteract its weight. **Ans. B**

4. m = 1.5kg, V = 12V, I = 20A, t = ?,
$c = 336 \times 10^3 J/Kg.$
mc = VIt
$t = mc/IV = \frac{(1.5 \times 336 \times 10^3)}{(20 \times 12)}$
t = 2100secs = (2100/60)mins.
t = 35mins **Ans. B**

5. Let the final temperature = T,
$\theta_1 = 90°$, $\theta_2 = 30°$
$m_1c (\theta_1-T) = m_2c (T-\theta_2)$
But $m_1 = m_2 = 200g$
$\rightarrow \theta_1-T = T-\theta_2$
$T+T = \theta_1+\theta_2$
$2T = \theta_1+\theta_2$
$T = (\theta_1+\theta_2)/2$
$T = (90+30)/2 = 120/2 = 60$
$T = 60°C$ **Ans. B**

6. The equation $P^XV^YT^Z$ = constant is Charles law when x = 0, y = 1, z = -1.
V^1T^{-1} = Constant
$\frac{V}{T}$ = Constant, which is Charles law.

Ans. B

7. Short-sightedness (also called myopia) is a condition of the eye where the light that comes in does not directly focus on the retina but in front of it. This causes the image that one sees when looking at a distant object to be out of focus but in focus when looking at a close object.

Ans. A

8. Dispersion of light by a glass prism is due to the different speeds that various colored rays move in glass. Each color in a ray of white light is then refracted in a slightly different direction on entering a glass prism.

Ans. B

9. To produce an enlarged and erect image with a concave mirror, the object must be positioned between the principal focus and the pole.

Ans. C

10. To convert an a.c. dynamo to d.c. dynamo, the slip rings are replaced with a split-ring commutator.

Ans. B

. The phase relationship of current and voltage for purely inductive and purely capacitive circuits are opposite. A phrase that may help to remember the relationship is:

ELI the ICE man

With E representing voltage (for emf) and I representing current. ELI indicates that with an inductance (L) the voltage leads the current by 90°. Similarly ICE tells you that with a capacitance (C) the current leads the voltage by 90°. **Ans. A**

. The purpose of dielectric material in parallel plate capacitors is to increase the capacitance of the capacitor. This means that the capacitance of a parallel plate capacitor depends on the nature of the dielectric material.

Ans. A

. Half-life of substance = 3mins.
At 6mins, count rate = 600
At 3mins, count rate = 2 x 600 = 1200
At 0mins, count rate 1200 x 2 = 2400

Ans. D

. If light with photon energy 2eV is incident on the surface of a metal with work function 3eV, no electron will be emitted.
The law of photoelectric emission states that for electron to be emitted from the surface of a metal, the photon energy has to be equal to or greater than the work function.

Ans. A

15. mass, $m = 1.0 \times 10^{-6}$ kg
Speed of light, $c = 3.0 \times 10^{8}$m/s
Energy obtained, $E = mc^2$
$E = 1.0\times10^{-6} \times (3.0\times10^{8})^2$
$= 9.0 \times 10^{10}$J

Ans. D

SUMMARY OF ANSWERS
[PHYSICS 2006/2007]

1.B	**2.**B	**3.**B	**4.**B	**5.**B
6.B	**7.**A	**8.**B	**9.**C	**10.**B
11.A	**12.**A	**13.**D	**14.**A	**15.**D

BONUS TIP

The Quick Subject Revision Aids in this book are repositories of likely examination questions for UNN post UTME/DE screening. Be wise enough to go through them thoroughly.

PHYSICS 2007/08 QUESTIONS

1. The extension of a spring when 5g weight was hung from it was 0.56cm. If Hooke's law is obeyed, what is the extension caused by a load of 20g weight?
   A. 1.12cm B. 2.14cm
   C. 2.52cm D. 2.24cm

2. The distance travelled by a particle starting from rest is plotted against the square of the time elapsed from the commencement of motion. The resulting graph is a measure of
   A. initial displacement
   B. initial velocity
   C. acceleration
   D. average velocity

3. A 90cm uniform lever has a load of 30N suspended at 15cm from one of its ends. If the fulcrum is at the centre of gravity, the force that must be applied at its other end to keep it in horizontal equilibrium is
   A. 15N B. 20N
   C. 30N D. 60N

4. Two points on a velocity-time graph have coordinates (5s, 10m/s) and (20s, 20m/s). Calculate the mean acceleration between the two points.
   A. $0.67m/s^2$ B. $0.80m/s^2$
   C. $1.50m/s^2$ D. $2.00m/s^2$

5. Which of the following statements are correct?
   i. Land and sea breezes are natural convection
   ii. The vacuum in a thermo flask prevents heat loss due to convection only
   iii. Convection may occur in liquids or gases but not in solids
   A. i and ii only
   B. ii and iii only
   C. i and iii only
   D. i, ii and iii only

6. The property of the eye known as its power of accommodation is controlled by the
   A. pupil B. vitreous humour
   C. iris D. ciliary muscles

7. Under constant tension and constant mass per unit length, the note produced by a plucked string is 500Hz when the length of the wire is 0.9m. At what length is the frequency 150Hz?
   A. 3m B. 0.27m
   C. 8.33m D. 6740m

8. An object is placed in front of two plain mirrors inclined at an angle of θ°. If the total number of images formed is 7, find the value of θ°.
   A. 30° B. 45°
   C. 51° D. 90°

9. The north pole of a magnet can never be separated from the south pole because of a property known as
   A. magnetic dipole
   B. magnetic moment
   C. magnetic monopole
   D. magnetic quadrupole

10. If the distance between two points charges is increased by a factor of four, the magnitude of electrostatic force between them will be
    A. ½ of its initial value
    B. ¼ of its initial value
    C. 1/16 of its initial value
    D. 4 times of its initial value

11. The terminal voltage of a battery is 4.0V when supplying a current of 2.0A; and 2.0V when supplying a current of 3.0A. The internal resistance of the battery is
    A. 0.5Ω **B.** 1.0Ω
    C. 2.0Ω **D.** 4.0Ω

12. The primary aim in high tension transmission is to
    A. Minimize electrical energy loses due to heat production
    B. Increase the rate of energy transfers by using high voltage
    C. Increase the current in the wires
    D. Generate electricity at high current and low voltage

13. Which of the following is required to convert a milliammeter to ammeter?
    A. A high resistance in parallel
    B. A low resistance in series
    C. A low resistance in parallel
    D. A high resistance in series

14. A light of energy 5eV falls on a metal and electrons with a maximum kinetic energy of 2eV are ejected. The work function of the metal is
    A. 0.4eV B. 2.5eV
    C. 3.0eV D. 7.0eV

15. One of the features of fission process is that
    A. its products are not radioactive
    B. it leads to chain reaction
    C. neutrons are not released
    D. the sum of the masses of the reactants equals the sum of the masses of the products

SUCCESS QUOTE

"There are no easy methods of learning difficult things; the method is to close your door, give out that you are not at home, and work."
~ Joseph de Maistre

PHYSICS 2007/2008 ANSWERS

1. $F \propto e \rightarrow F = ke \rightarrow F/e = k$
   This implies that $\frac{F_1}{e_1} = \frac{F_2}{e_2}$
   $F_1 = 5g$, $e_1 = 0.56$, $F_2 = 20g$, $e_2 = ?$
   $$\frac{5g}{0.56} = \frac{20g}{e_2}$$
   $$e_2 = \frac{(20g \times 0.56)}{5g} = 2.24cm$$
   Ans. D

2. In motion, when distance (s) is plotted against the square of time (t^2), the resulting graph is called s-t^2 graph. The most important property of this graph is that its slop, given by $\Delta s(m)/\Delta t^2(s^2)$, is a measure of the acceleration of the body in motion. **Ans. C**

3. Length of uniform lever = 90cm
   If the fulcrum is at the centre of gravity, then the distance between fulcrum and the end of the lever is 45cm.
   Let the force applied at the other end be F.
   $\rightarrow 45 \times F = 30 \times 30 = 900$
   $F = 900/45 = 20N$ **Ans. B**

4. At point A, v = 10m/s, t = 5s
   $\rightarrow a_A = v/t = 10/5 = 2m/s^2$
   At point B, v = 20m/s, t = 20s
   $\rightarrow a_B = 20/20 = 1m/s^2$.
   $$\text{mean acceleration} = \frac{(2+1)}{2} = 1.5m/s^2$$
   Ans. C

5. Convection is heat transfer as a result of mass transfer, which can be natural or forced. Natural convection cycles occur in liquids and gases. **Ans. C**

6. Accommodation is the process by which the vertebrate eye changes optical power to maintain a clear image on an objects as its distance changes. Accommodation acts like a reflex, but can also be consciously controlled. Mammals, birds and reptiles vary the optical power by changing the form of the elastic lens using ciliary muscles.
   Ans. D

7. The frequency of the note produced by a sonometer wire is inversely proportional to the length of the wire provided the tension and the mass per unit length are kept constant.
   Mathematical,
   $\propto \frac{1}{}$ (at const. T and M)
   $= -$
   $\rightarrow fl = k \rightarrow f_1 l_1 = f_2 l_2$
   $2 = \frac{1\ 1}{2}$
   $f_1 = 500Hz$, $l_1 = 0.9m$,
   $l_2 = ?$, $f_2 = 150Hz$
   $$l_2 = \frac{500 \times 0.9}{150} = 3m$$
   Ans. A

8. $\left(\frac{360}{\theta}\right) - 1 = n$ Where n is the total number of images formed.
   $\left(\frac{360}{\theta}\right) - 1 = 7$
   $\left(\frac{360}{\theta}\right) = 7+1 = 8$
   $\theta = \frac{360}{8} = 45°$ **Ans. B**

9. Magnetic poles have always been observed to occur in pairs, never singly. Two opposite poles form what is called a magnetic dipole. When a bar magnet

is broken, we do not get two single isolated poles. Rather, we get two shorter magnets, each with a north and south pole. **Ans. A**

10. The force between two point charges is inversely proportional to the square of the distance between them, i.e.
$F \propto \frac{1}{d^2} \rightarrow F = \frac{k}{d^2}$
where F = force, d = dist. and k = const.
If distance is increased by a factor of four, then d = 4. This gives
$F = \frac{k}{4^2} = \frac{k}{16}$
Therefore, $F = \frac{1}{16}$ of its initial value.
Ans. C

11. $E - V = Ir$
$E - 2 = 3r$.....(1)
$E - 4 = 2r$.....(2)
Subtracting equation (2) from equation (1) gives, $r = 2\Omega$ **Ans. C**

12. The primary aim in high tension transmission is to minimize electrical energy losses due to heat production. For power transmission over long distances, transformers provide a means to increase (step up) the voltage and reduce the current to cut down or minimize the resistive I^2R losses.
Ans. A

3. A shunt is a resistor of very low resistance that is usually connected in parallel across a galvanometer or a milliammeter in order to convert it to an ammeter **Ans. C**

4. $E = W + k.e$
$5 = W + 2$
$W = 5 - 2$
$W = 3.0eV$ **Ans. C**

15. Note the following:
(i) A chain reaction is a sequence of reactions where a reactive product causes additional reactions to take place.
(ii) A fissile material is one that is capable of sustaining a chain reaction of nuclear fission.
(iii) When an atom undergoes nuclear fission, a few neutrons are ejected from the reaction. These free neutrons will then interact with the surrounding medium and if more fissile fuel is present, some may be absorbed and cause more fissions. Thus, the cycle repeats to give a reaction that is self-sustaining.
Ans. B

SUMMARY OF ANSWERS
[PHYSICS 2007/2008]

1.D	2.C	3.B	4.C	5.C
6.D	7.A	8.B	9.A	10.C
11.C	12.A	13.C	14.C	15.B

DONT FORGET

SURE SUCCESS is more than just a book. It's a Divine Project. Don't fall into the temptation of photocopying or preparing with a photocopy of the book. You may be sowing the seed for your frustration in life.

PHYSICS 2008/2009 QUESTIONS

1. The extension of a spring when 5g weight was hung from it was 0.56cm. If Hooke's law is obeyed, what is the extension caused by a load of 20g weight?
   A. 2.60 m/s^2 B. 0.26 m/s^2
   C. 3.40 m/s^2 D. 12.00 m/s^2

2. A car of mass 1500kg goes round a circular curve of radius 50m at a speed of 40m/s. The magnitude of centripetal force on the car is
   A. 1.2×10^2N B. 1.2×10^3N
   C. 4.8×10^3N D. 4.8×10^4N

3. The efficiency of a machine is always less than 100% because
   A. load lifted is always greater than work input
   B. load lifted is always greater than the applied effort
   C. Effort applied is always greater than mechanical advantage
   D. velocity ratio is always greater than the mechanical advantage

4. Which of these statements is not true? Thermostats are used to control the temperature of
   A. pressure cookers
   B. laundry irons
   C. hot water storage tanks
   D. aquaria for tropical fish

5. A given mass of an ideal gas occupies a volume V at a temperature T and under a pressure P. If the pressure is increased to 2P and the temperature reduced to 1/2T, then the percentage change in volume of the gas is
   A. 25% B. 75%
   C. 300% D. 1%

6. The thermometric property of a constant volume thermometer is
   A. change in pressure
   B. change in length
   C. differential expansion
   D. change in volume

7. The combination of sound waves with different frequencies is known as
   A. interference B. diffraction
   C. superposition D. resonance

8. Which of the following characteristics of a wave is used in the measurement of the depth of the sea?
   A. Refraction B. Reflection
   C. Diffraction D. Interference

9. Which of the following eye defects can be corrected using a cylindrical lens?
   A. Astigmatism
   B. Presbyopia
   C. Chromatic aberration
   D. Myopia

10. The resistance of a wire depends on
    A. the length of the wire
    B. the area of the wire
    C. the temperature of the wire
    D. all of the above

11. A dynamo primarily converts
    A. mechanical energy into electrical energy
    B. electrical energy into kinetic energy
    C. potential energy into kinetic energy
    D. kinetic energy into potential energy

2. If a current carrying coil is mounted on a metal frame, the back emf induced in the coil causes
   A. inductance
   B. eddy current
   C. electromagnetism
   D. dipole moment

3. Which of the following may be found in light nuclei?
   i. β-particles
   ii. protons
   iii. neutrons
   iv. α-particles
   A. i and ii only
   B. i and iii only
   C. i and iv only
   D. ii and iii only

4. The difference between X-rays and γ-rays is that
   A. X-rays arise from energy changes and are due to electrons while γ-rays come from the nucleus
   B. X-rays are electromagnetic, radiations while γ-rays are not
   C. X-rays have higher frequencies than γ-rays
   D. X-rays are more penetrating than γ-rays

5. When an atom loses or gains a charge, it becomes
   A. an electron
   B. an ion
   C. a neutron
   D. a proton

SUCCESS QUOTE

"...Promotion cometh neither from the east, nor from the west, nor from the south."
~ *Psalm 75 vs 6*

PHYSICS 2008/09 ANSWERS

1. Let the resultant of the two mutually perpendicular forces be F.
   $F=\sqrt{(12^2+5^2)} = \sqrt{(144 + 25)} = 13N$
   But F = ma
   $\longrightarrow a = F/m = 13/5 = 2.6m/s$
   Ans. A

2. $F = \frac{mv^2}{r} = \frac{(1500\times40^2)}{50}$
   $F = 48000N = 4.8\times10^4N$
   Ans. D

3. Mechanical efficiency is basically a measure of what you get out of what you put in - that is, the useful work output for the energy input. Efficiency is given as a fraction (or percentage):
   $\text{Efficiency} = \frac{M.A}{V.R} \times 100\%$
   Efficiency is always less than 100% because velocity ratio is always greater than mechanical advantage.
   Ans. D

4. A thermostat is the component of a control system which regulates the temperature of a system so that the system's temperature is maintained near a desired setpoint temperature. Thermostats are component parts of aquarium heaters, pressure cookers and laundry irons.
   Ans. C

5. $\frac{P_1V_1}{T_1} = \frac{2P_1V_2}{\frac{1}{2}T_1}$
   This relation is gotten from the combined

gas law. It follows that

$$V_2 = \frac{(V_1 \times P_1 \times \frac{1}{2}T_1)}{(T_1 \times 2P_1)} = \frac{V_1}{4}$$

Converting to percentage, we have

$V_2 = \frac{V_1}{4} \times 100\% = 25\%$ of V_1

Ans. A

6. The relationship that allows a gas to be used to measure temperature in a constant-volume gas thermometer is that the pressure and volume are directly proportional to temperature: PV α T. Holding the volume of a gas constant gives P α T. Thus, with a constant-volume gas thermometer, temperature is read in terms of pressure. **Ans. A**

7. With respect to waves, superposition principle posits that the amplitude caused by two or more waves traversing the same space, is the sum of the amplitudes which would have been produced by the individual waves separately. In other words, it is the combining of waves. **Ans. C**

8. Depth of the sea is measured by two basic methods: by using the acoustic echo sounders on the ships and by using data from the satellite altimeters. As the name suggests, the echo sounders measure the depth of the sea by using echo of sound as measure. The instrument transmits a 10-30KHz sound that gets reflected from the sea floor. The echo from the sea floor determines the depth of the sea. **Ans. B**

9. Astigmatism can be corrected/reduced by reducing the effective area of the lens with an aperture or by adding a cylindrical lens to compensate. **Ans. A**

10. The resistance of a wire is directly proportional to the length of the wire and inversely proportional to its cross-sectional area. The resistance also depends on the temperature of the wire. **Ans. D**

11. A dynamo is a machine which transforms mechanical energy to electrical energy. It produces an emf at its terminals by electromagnetic induction. **Ans. A**

12. If a current carrying coil is mounted on a metal frame, the back emf induced in the coil causes Eddy Current. Eddy Currents are swirling movements of charge. They are currents induced in conductors, when the conductors are exposed to changing magnetic field due to relative motion of the field source and the conductor; or due to variation of the field with time. **Ans. B**

13. Out of all the particles given in the options, it is only protons and neutrons that may be found in light nuclei. Note that the nuclei of heavier atoms differ from light nuclei by having more neutrons and protons. **Ans. D**

. X-rays and γ-rays are usually distinguished by their origins: X-rays are emitted by electrons outside the nucleus, while γ-rays are emitted by the nucleus. **Ans. A**

. When an atom loses or gains a charge, it becomes an ion. An ion is an atom or molecule in which the total number of electrons is not equal to the total number of protons, giving it a net positive or negative electrical charge. **Ans. B**

SUMMARY OF ANSWERS

[PHYSICS 2008/2009]

A	**2.**D	**3.**D	**4.**C	**5.**A
A	**7.**C	**8.**B	**9.**A	**10.**D
.A	**12.**B	**13.**D	**14.**A	**15.**B

SUCCESS QUOTE

"Whether you think you can or think you can't - you are right."
~ Henry Ford

PHYSICS 2009/2010 QUESTIONS

1. A body falls freely under gravity ($g=9.8m/s^2$) from a height of 10m on top of a platform 0.8m above the ground. Its velocity on reaching the platform is
   A. 7848m/s B. 80m/s
   C. 78m/s D. 27.78m/s

2. A hydrometer is an instrument used for measuring the
   A. depth of water in a vessel
   B. relative density of a liquid by method of flotation
   C. relative density of a liquid by finding the apparent loss in weight
   D. relative humidity of the atmosphere

3. A bead traveling on a straight wire is brought to rest at 0.2m by friction. If the mass of the bead is 0.01kg and the coefficient of friction between the bead and the wire is 0.1, determine the work done by friction.
   A. 2×10^{-4}J B. 2×10^{-3}J
   C. 2×10^{1}J D. 2×10^{2}J

4. A machine whose efficiency is 60% has a velocity ratio of 5. If a force of 500N is applied to lift a load of P(N), what is the magnitude of P?
   A. 750N B. 4166N
   C. 500N D. 1500N

5. A mass of gas at 7°C and 70cm of mercury has a volume of $1200cm^3$.

Determine its volume at 27°C and a pressure at 75cm of mercury.

A. $1200cm^3$ B. $1378cm^3$
C. $4320cm^3$ D. $4629cm^3$

6. A motor tyre is inflated to pressure of when the temperature of air is 27°C. What will be the pressure at 87°C assuming the volume does not change?

A. $2.6 \times 10^{-5} Nm^{-2}$ B. $2.4 \times 10^{-5} Nm^{-2}$
C. $2.2 \times 10^{-5} Nm^{-2}$ D. $1.3 \times 10^{-5} Nm^{-2}$

7. A beam of light is incident from air to water at an angle of 30°. Find the angle of refraction if the refractive index of water is 4/3.

A. 15° B. 18°
C. 22° D. 240°

8. The wavelength of signal from a radio transmitter is 1500m and the frequency is 200KHz. What is the velocity of the propagation?

A. $3 \times 10^{8} ms^{-2}$ B. $7 \times 10^{3} ms^{-2}$
C. $3 \times 10^{4} ms^{-2}$ D. $7ms^{-2}$

9. A boy on looking into a mirror discovers that his face appeared to have grown bigger. The boy must have been looking at a

A. convex mirror with his face at the focus
B. concave mirror with his face between the focus and the mirror
C. convex mirror with his face between the focus and the mirror
D. concave mirror with his face at the focus

10. Find the frequencies of the first three harmonics of a piano string of length 1.5m, if the velocity of the string is 120m/s.

A. 40Hz, 80Hz, 120Hz
B. 180Hz, 360Hz, 540Hz
C. 80Hz, 160Hz, 240Hz
D. 360Hz, 180Hz, 90Hz

11. The resistance of a piece of wire of length 20cm and cross-sectional area and resistivity is

A. 1.0Ω B. 10.0Ω
C. 400.0Ω D. $1.0 \times 10^{-13} \Omega$

12. An electric device is rated 2000W, 250V. The correct fuse rating of the device is

A. 8A B. 9A
C. 7A D. 6A

13. Determine the inductive reactance when a 30.0mH inductor with negligible resistance is connected to a 1.3KHz oscillator

A. 39.0Ω B. 122.5Ω
C. 245.0Ω D. 39KΩ

14. The half-life of a radioactive element is 9days. Calculate the fraction that remains after 36days?

A. 1/32 B. 1/16
C. 1/4 D. 15/32

15. The graphite rods surrounding the uranium fuel rods in a nuclear reactor

are used to

A. absorb the neutrons and hence halt the nuclear process
B. create the neutrons and hence slow down the nuclear process
C. slow down the neutrons and hence slow down the nuclear process
D. speed up the neutrons and hence speed up the nuclear process

FEATURES OF THIS BOOK

- **Quick Subject Revision Aids**
- **Admission Success Secrets**
- **Bonus Tips**
- **Success Quotes**
- **Answers to Frequently Asked Questions (FAQ's)**

In the *Quick Subject Revision Aids*, efforts were made to highlight the basic concepts of the subjects and to provide insights into the likely examination questions. The *Admission Success Secrets* are geared towards solving the problem of lack of admission orientation among candidates and providing answers to their *Frequently Asked Questions*.
The *Bonus Tips* provide you with those extra information you need to have an edge over others. *Success Quotes* were also included to get you motivated, because if you are motivated, then you are already half-way to your success.
If you can't find the above features in the material you bought, please call 08060848179 to get an original copy of SureSuccess. God bless you.

PHYSICS 2009/2010 ANSWERS

1. Since the body started falling from a height of 10m above the platform, and the required velocity is the velocity on reaching the platform, the height of the platform above the ground is not important.
   $v^2 = u^2 + 2gs$
   where $u = 0$, $g = 9.8m/s^2$, $s = 10m$
   $v^2 = 2 \times 9.8 \times 10 = 196$
   $v = \sqrt{196} = 14m/s$

2. A hydrometer is an instrument used to measure the specific gravity (or relative density) of liquids; that is, the ratio of the density of the liquid to the density of water. This should not be confused with hygrometer (which is an instrument used for measuring the moisture content in the environmental air, or humidity). **Ans. B**

3. $s = 0.2m$, $m = 0.01kg$, $\mu = 0.1$, $W = ?$
   $g = 9.8m/s^2$.
   $W = Fs$, where $F = \mu R = \mu mg$
   $F = 0.1 \times 0.01 \times 9.8 = 9.8 \times 10^{-3}N$
   $W = 9.8 \times 10^{-3} \times 0.2 \approx 2 \times 10^{-3}J$
   Ans. B

4. $\xi = \frac{(L/E)}{(VR)} \times 100\%$
   $\frac{60}{100} = \frac{(P/500)}{5} = \frac{P}{(5 \times 500)}$
   $P = \frac{(60 \times 5 \times 500)}{100}$
   $P = 1500N$ **Ans. D**

5. Converting the given temperatures from degree Celsius to Kelvin, we have that

t(°C) + 273 = T(K), 7°C + 273 = 280K

27°C + 273 = 300K

$\frac{(P_1V_1)}{T_1} = \frac{(P_2V_2)}{T_2}$

$\frac{(70 \times 1200)}{280} = \frac{(75 \times V_2)}{300}$

$V_2 = \frac{(70 \times 1200 \times 300)}{(280 \times 75)}$

$V_2 = 1200cm^3$

Ans. A

6. Note that the pressure of a gas at constant volume is directly proportional to its absolute temperature. This implies that,

$\frac{P}{T}$ = constant or $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

From the question, $P_1 = 2.0 \times 10^5 N/m^2$, $T_1 = 27°C = 300K$, $P_2 = ?$, $T_2 = 87°C = 360K$

$\frac{(2.0 \times 10^5)}{300} = \frac{P_2}{360}$

$P_2 = \frac{(2.0 \times 10^5 \times 360)}{300}$

$P_2 = 240000 = 2.4 \times 10^5 N/m2$

Ans. B

7. (Sin30)/Sinr = ¾

Sinr = ¾Sin30 = ¾ × ½ = ⅜

r = $\sin^{-1}$(⅜) = 22° **Ans. C**

8. λ = 1500m, f = 200KHz = 200 000Hz, v = ?

v = fλ = 200 000 × 1500 = 300 000 000

$v = 3 \times 10^8 m/s$ **Ans. A**

9. Note that for a convex mirror, regardless of the position of the object, the image formed is always virtual, erect and diminished.

For concave mirrors, when an object is placed at the focus, the image formed is at infinity. But when an object is placed between the focus and the mirror (or the pole), the image formed is virtual, erect and magnified. **Ans. B**

10. For a piano string, we note that the vibrating length (ℓ) of the first harmonic is $\ell = \frac{\lambda}{2}$ so that $\lambda = 2\ell$.

The frequency of the first harmonic,

$f_0 = \frac{v}{\lambda} = \frac{v}{2\ell}$

Also, $f_1 = 2f_0$, $f_2 = 3f_0$

where f_1 and f_2 are frequencies of the 2nd and 3rd harmonics respectively.

From the question, l = 1.5m, v = 120m/s.

Using that, we obtain f_0 = 40Hz, f_1 = 80Hz, f_2 = 120Hz. **Ans. A**

11. $R = \frac{(\rho l)}{A} = \frac{(4 \times 10^{-7} \times 0.2)}{(8 \times 10^5)}$

$R = 1.0 \times 10^{-13}\Omega$ **Ans. D**

12. P = IV, I = P/V

I = 2000/250 = 8A **Ans. A**

13. X_L = ?, L = 30mH = 30×10^{-3}H, f = 1.3KHz = 1.3 × 1000Hz

$X_L = 2\pi \times 1.3 \times 1000 \times 30 \times 10^{-3}$

$X_L = 245.0\Omega$ **Ans. C**

14. Let,

N_0 = the original number of nuclei

N = the number of nuclei left after time, t.

$T_{½}$ = half-life = 9days

t = time = 36days

The fraction left is given by

$N/N_0 = (½)^{t/T_{½}} = (½)^{36/9} = \frac{1}{16}$

Ans. B

15. In nuclear reactors, nuclear fission

occurs with the atoms of atomic weight 235 when uranium is used. Fission takes place only if the bombarding neutron is slow. Graphite is therefore used round the uranium to slow down the neutron, so that the chain reaction is prevented from dying out.

Ans. C

SUMMARY OF ANSWERS
[PHYSICS 2009/2010]

.	2.B	3.B	4.D	5.A
.B	7.C	8.A	9.B	10.A
1.D	12.A	13.C	14.B	15.C

SUCCESS QUOTE

Eventually, people will always pay you for what you know and you will always pay for what you don't know. Your *learning power* is your *earning power*. Grab the opportunity to set the right foundation for learning now!

~ Fela Durotoye

PHYSICS 2010/11 QUESTION
[Day 1]

1. Two forces whose resultant is 100N are at right angles to each other. If one of them makes an angle of 30° with the resultant, find the magnitude of the other force.
   A. 8.66N B. 86.6N
   C. 50.0N D. 5.0N

2. A body of weight WN rests on a smooth plane inclined at an angle θ° to the horizontal. The component of the weight down the slope is
   A. Wsinθ B. Wcosθ
   C. Wtanθ D. Wsecθ

3. A body of mass 100g moves with a velocity of 10.0ms^{-1} and collides with a wall. After the collision, the body moves with a velocity of 2.0ms^{-1} in the opposite direction. The change in momentum is
   A. 8.0Ns B. 1.2Ns
   C. 12.0Ns D. 80Ns

4. A 12V battery supplying a current of 20A was used to melt 1.5kg of ice at 0°C. Calculate the time required if the latent heat of fusion of ice is 336×10^3J/Kg.
   A. 35.0min B. 3.5min
   C. 76min D. 21.0min

5. The light from the sun reaches the earth mainly by
   A. convection B. conduction
   C. radiation D. reflection

6. One valid assumption of the kinetic theory of gases is that:
   A. the molecules are in random motion and the number of collisions is constant
   B. the number of molecules increases with the pressure

C. the molecules of the gas are all identical and are very small in size
D. the number of molecules increases with temperature

7. An astronomical telescope is said to be in normal adjustment when the
   A. eye is accommodated
   B. focal length of objective lens is longer than that of the eye piece
   C. final image is at the near point of the eye
   D. final image is at infinity

8. Dispersion of light by a glass prism is due to the
   A. different hidden colours of the glass
   B. different speeds of the various colours in glass
   C. defects in the glass
   D. high density of glass

9. A guitar string of length 33cm is under a tension of 55N. If the fundamental frequency is 196Hz, find the speed of wave on string.
   A. 6m/s B. 0.33m/s
   C.129m/s D. 726m/s

10. A transformer has 400 turns as its primary winding and 100 turns as secondary winding. If the primary coil is connected to a 12V source, the transformer functions as
   A. a step down transformer with secondary emf = 6V
   B. a step down transformer with secondary emf = 3V
   C. a step up transformer with secondary emf = 24V
   D. a step up transformer with secondary emf = 48V

11. A battery of internal resistance of 2Ω has a voltage of 4.0V when supplying a current of 2.0A. Calculate the terminal voltage if it now supplies a current of 3.0A.
   A. 2.0V B. 6.0V
   C. 1.5V D. 12.0V

12. The purpose of a dielectric material in a parallel plate capacitor is to
   A. increase its capacitance
   B. decrease its capacitance
   C. insulate the plates from each other
   D. increase the magnetic field between them

13. The name of an atom is associated with its atomic number Z, mass number A and neutron number N. Therefore:
   A. A= Z+N B. Z= A+N
   C. N= A+Z D. A= N-Z

14. A nuclear reaction initiated by adding neutron is called
   A. nuclear fission
   B. nuclear fusion
   C. nuclear enrichment
   D. radioactivity

15. The mass defect resulting from a thermonuclear reaction is 9.8×10^{-30}Kg. Calculate the energy released. Take $c = 3\times10^{8}$m/s.
   A. 2.94×10^{-22}J B. 8.82×10^{-22}J
   C. 8.82×10^{-14}J D. 8.82×10^{-13}J

SUCCESS QUOTE

"Intellectual growth should commence at birth and cease only at death."
~ Albert Einstein

PHYSICS 2010/11 ANSWERS

[Day 1]

. Let the magnitude of the other force be F.

Sin30 = F/100

F = 100Sin30 = 100×0.5 = 50N

Ans. C

. When a body of weight WN rests on a smooth plane inclined at an angle θ° to the horizontal, the normal reaction of the plane on the body is given by WCosθ while the component of the weight down the slope is Wsinθ. **Ans. A**

. Recall that momentum is simply defined as the product of mass and velocity of a body in motion. Change in momentum is otherwise referred to as impulse.

Impulse = change in momentum

= final momentum - initial momentum

= mv - mu = m(v - u)

But m = 100g = 0.1Kg, u = 10m/s,

v = -2m/s

Impulse = 0.1[10 - (-2)] = 0.1 × 12

= 1.2Kgm/s

Ans. B

V = 12V, I = 20A, m = 1.5kg, t = ?,

c = 336 x 10^3J/Kg.

mc = VIt

$$t = \frac{mc}{IV} = \frac{(1.5 \times 336 \times 10^3)}{(20 \times 12)}$$

t = 2100secs = (2100/60)mins.

t = 35mins

Ans. A

Compare with Question No 4 of year 2006/07.

5. Conduction and convection require some material as a transport medium. Radiation, which refers to energy transfer by electromagnetic waves, needs no medium. Light energy from the sun is transferred to the earth through empty space by radiation.

Ans. C

6. One essential postulate of kinetic theory of ideal gases is that every gas consists of a very large number of tiny particles called molecules. Molecules of the same gas are identical in all respects i.e. they have the same mass, shape and size but differ from molecules of another gas.

Ans. C

7. The astronomical telescope is an instrument used for viewing distant objects, such as the stars and other planets. It consists of two converging lenses mounted so that they have the same axis. The lenses can be arranged so that the final image is at infinity. In such an arrangement the principal focus of the objective must coincide with that of the eye-piece. In this arrangement, the telescope is said to be in normal adjustment.

Ans. D

8. Note that visible light, also known as white light, consists of a collection of component colours. These colours are often observed as light passes through a triangular prism. Upon passage through the prism, the white light is seperated into its component colours-

red, orange, yellow, green, blue, indigo, violet. The seperation of visible light into its different colours is known as dispersion. Dispersion is due to the different speeds that the component colour rays move in glass prism.

Ans. B

Compare with Question No 8 of year 2006/07.

9. $f_0 = v/2l$
   $196 = v/(2\times0.33)$
   $v = 196\times2\times0.33 = 129.36m/s$

Ans. C

10. 400turns = 12V,
    100turns = (100×12)/400 = 3V

Ans. B

11. From $V = Ir$, $\frac{V}{I} = r$ where r = constant.
    $\rightarrow \frac{V}{I}$ = constant or $\frac{V_1}{I_1} = \frac{V_2}{I_2}$
    $\frac{4}{2} = \frac{V_2}{3}$
    $V_2 = \frac{(4\times3)}{2} = 6V$

Ans. B

12. Note that an insulating material which has the effect of increasing the capacitance of a vacuum-filled parallel plate capacitor, when it is inserted between its plates, is called a dielectric material, and the factor by which the capacitance is increased is called the dielectric constant of the material.

Ans. A

Compare with Question No 12 of year 2006/07

13. The proton and the neutron form the nucleus of the atom and give the atom its mass. Hence,

$A = Z + N$ **Ans. A**

14. In nuclear physics, nuclear fission is a nuclear reaction in which the nucleus of an atom splits into smaller parts (lighter nuclei), often producing free neutrons and photons, and releasing a tremendous amount of energy. Nuclear fission is usually induced by a neutron, although it is occasionally seen as a form of sponteneous radioactive decay. **Ans. A**

15. $E = mc^2 = 9.8\times10^{-30} \times (3\times10^8)^2$
    $= 9.8\times10^{-30} \times 9\times10^{16}$
    $= 9.8 \times 9 \times 10^{-30} \times 10^{16} = 88.2 \times 10^{-14}$
    $= 8.82 \times 10^{-13}J$

Ans. D

SUMMARY OF ANSWERS

[PHYSICS 2010/2011 (Day 1)]

1.C	**2.**A	**3.**B	**4.**A	**5.**C
6.C	**7.**D	**8.**B	**9.**C	**10.**B
11.B	**12.**A	**13.**A	**14.**A	**15.**D

SUCCESS QUOTE

"For I know the thoughts and plans that I have for you, declares the Lord, thoughts and plans for your welfare, peace and prosperity and not for evil, to give you a future and hope in your final outcome."

~ Jeremiah. 29:11

PHYSICS 2010/11 QUESTION
[Day 2]

1. Which of the following statements is true of the period of a simple pendulum?
   A. it depends on the mass of the bob and the acceleration due to gravity
   B. it depends on the length of the string and the acceleration due to gravity
   C. it depends on the mass of the bob and the length of the string
   D. it depends on the mass of the bob, the length of the string and acceleration due to gravity.

2. A boat travels due east with a speed of $40ms^{-1}$ across a river flowing due south at $30ms^{-1}$. Calculate the resultant speed of the boat:
   A. $1.3ms^{-1}$ B. $10.0ms^{-1}$
   C. $50.0ms^{-1}$ D. $70.0ms^{-1}$

3. The atmospheric pressure due to water is $1.3\times10^{6}Nm^{-2}$. What is the total pressure at the bottom of an ocean 10m deep? (Density of water = $1000kgm^{-3}$ and $g=10\ ms^{-2}$)
   A. $1.3\times10^{7}\ Nm^{-2}$ B. $1.4\times10^{6}\ Nm^{-2}$
   C. $1.4\times10^{5}\ Nm^{-2}$ D. $1.0\times10^{5}Nm^{-2}$

4. Which of the following conditions will make water boil at a temperature of 100°C and saturation vapour pressure of 750mmHg?
   A. decrease the external pressure
   B. heat more rapidly at the same pressure
   C. increase the external pressure
   D. reduce the quantity of water

5. The density of a fixed mass of gas at constant pressure is
   A. constant with temperature
   B. directly proportional to the temperature
   C. inversely proportional to the temperature
   D. directly proportional to its volume

6. Which of the following equations is incorrect about an ideal gas (all the symbols have their usual meanings)
   A. $PV= nRT$ B. $PV/T=$ constant
   C. $PV= 3/2nRT$ D. $TV/P=$ constant

7. The equation of a wave traveling along the positive x-direction is given by $y = 0.20\sin(500t - 20x)$. The amplitude, angular frequency and wavelength of the wave are respectively given by
   A. 0.2cm, 500rad/s, 20cm
   B. 0.2cm, 500rad/s, 0.1πcm
   C. 0.2cm, 2×10^{-3}rad/s, 0.1πcm
   D. 5cm, 2×10^{-3}rad/s, 0.05cm

8. When a plane mirror at which a ray of light is incident is rotated through an angle θ, the reflected ray will be rotated through
   A. $1/2\theta$ **B.** θ
   C. 2θ **D.** 3θ

9. The quality of sound depends on its
   A. frequency B. wavelength
   C. velocity D. harmonics

10. The resistance of a piece of wire of length 20m and cross sectional area $8\times10^{-6}m^{2}$ has a resistance of 1Ω. The resistivity of the wire is
    A. $3\times10^{-7}\Omega/m$ B. $4\times10^{-7}\Omega/m$
    C. $1.6\times10^{-5}m^{2}$ D. $4\times10^{-5}\Omega/m$

11. In an AC circuit that contains only a capacitor, the voltage
    A. leads the current by 90°
    B. lags behind the current by 90°

C. leads the current by 180°
D. lags behind the current by 180°

2. The angle between the direction of the earth's magnetic field and the horizontal is called
A. angle of deviation
B. magnetic declination
C. magnetic meridian
D. angle of dip

3. Which of these statements is not correct concerning atomic structure?
A. negatively charged electrons orbit the positively charged nucleus
B. electromagnetic forces bind the electrons to the nucleus
C. protons and neutrons have approximately equal mass
D. the number of electrons orbiting the nucleus is equal to the number of nucleons

14. The half-life of a radioactive element is 9days. Calculate the fraction that remains after 36days.
A. 1/32 B. 1/16
C. ¼ D. 15/32

15. One of the features of the fission process is that
A. it leads to chain reaction
B. its products are not radioactive
C. neutrons are not released
D. mass and energy are conserved

SUCCESS QUOTE

"Motivation is what gets you started. Habit is what keeps you going."
~unknown

PHYSICS 2010/11 ANSWER [Day 2]

1. In a simple pendulum, the period is given by $T = 2\pi [\sqrt{(l/g)}]$, where l is the length of the string and g is the acceleration due to gravity.
Ans. B

2. Let the resultant speed be R.
$R = \sqrt{(40^2 + 30^2)} = \sqrt{2500} = 50m/s.$
Ans. C

3. Total pressure = atmospheric pressure + pressure due to depth of ocean.
= atm. pressure + ρgh
$= 1.3\times10^5 + (1000\times10\times10)$
$= 1.4 \times 10^6 Nm^{-2}$
Ans. B

4. Generally, a liquid boils at the temperature at which its saturation vapour pressure is equal to the external pressure. At standard atmospheric pressure, 760mmHg, water boils at 100°C.
For water to boil at a temperature of 100°C and saturation vapour pressure of 750mmHg, the external pressure must be decreased. **Ans. A**

5. Note that with respect to gas, pressure and temperature are directly related. That is to say, as pressure increases, temperature increases. This is deduced from the ideal gas law:
$PV=nRT$ .....(1)
Where P is pressure and T is temperature. Also, Density is:
$D=\frac{M}{V}$ .....(2)
Where M is mass and V is volume.
From (2),
$V = \frac{M}{D}$ .....(3)

Plug (3) into (1) above:

$$\frac{PM}{D} = nRT$$

So the D is on the bottom and therefore is inversely proportional to both temperature and pressure. In other words, as temperature and/or pressure go up, the density will go down, and vice versa. Note that if either of temperature or pressure is kept constant, the inverse proportionality will still hold.

Ans. C

6. Recall the following:
   (A.) The Pressure law:
   Pressure = constant x Temperature
   (B.) Charles law:
   Volume = constant x Temperature
   (C.) The combined gas law:
   (A) and (B) above are combined into one law:

$$\frac{PV}{T} = \text{constant}$$

   (D.) The ideal gas law (equation):

$$PV = nRT$$

   (E.) For noble gases (He, Ne, Ar, Kr, Xe, Rn):

$$PV = \frac{3}{2}nRT$$

Ans. D

7. Given: $y = 0.20\sin(500t - 20x)$
   Comparing the given wave equation with the standard wave equation: $y = A\sin(\omega t - 2\pi x/\lambda)$,
   we have that: $A = 0.20$cm,
   $\omega t = 500t \rightarrow \omega = 500$rad/s
   $(2\pi x)/\lambda = 20x \rightarrow 2\pi/\lambda = 20$
   $\rightarrow \lambda = 2\pi/20 = 0.1\pi$

Ans. B

8. When a fixed incident light ray is normal to a plane mirror, it is reflected back the way it came. However, if the mirror is tilted through an angle, then the angle of the reflected light ray is twice the angle through which the mirror is tilted.

Ans. C

9. The quality of a tone is the characteristic that enables it to be distinguished from another of basically the same intensity and frequency. Tone quality is determined by the harmonics (overtones) present in the given tone.

Ans. D

10. Resistivity, $\rho = RA/l = (1 \times 8\times10^{-6})/20$
    $= 4\times10^{-7}\Omega$m

Ans. B

11. Note the following:
    (I.) Pure Capacitive AC circuit: capacitor voltage lags capacitor current by 90°.
    (II.) Pure Inductive AC circuit: inductive voltage leads inductive current by 90°.
    (III.) Pure Resistive AC circuit: voltage and current are in phase.

Ans. B

Compare with Question No 11 of year 2006/07

12. Magnetic declination is the angle between magnetic north and true north while magnetic inclination (or angle of dip) is the angle between the horizontal plane and the total field vector, measured positive into earth.

Ans. D

13. Note that the particles inside the nucleus are called nucleons. It is believed that the nucleus of an atom is built up of protons and neutrons, though other particles have been discovered in the nucleus. The number of electrons orbiting the nucleus cannot be equal to the number of nucleons. Rather, it is equal to the number of protons.

Ans. D

14. Let,
    N_0 = the original number of nuclei

N = the number of nuclei left after time, t.

$T_{½}$ = half-life = 9days

t= time = 36days

The fraction left is given by

$N/N_0 = (½)^{t/T½} = (½)^{36/9} = 1/16$

Ans. B

15. Nuclear fission is an extremely complex reaction representing a cataclysmic division of an atomic nucleus into two nuclei of comparable mass. This division of heavy nuclei may take place naturally (spontaneous fission) or under bombardment with neutrons, charged particles, gamma rays, or other carriers of energy (induced fission). Nuclear fission also releases two or more free neutrons. The free neutrons can bombard other nuclei, leading to a series of fissions called a chain reaction. **Ans. A**

SUMMARY OF ANSWERS

[PHYSICS 2010/11 (Day 2)]

1.B	2.C	3.B	4.A	5.C
6.D	7.B	8.C	9.D	10.B
11.B	12.D	13.D	14.B	15.A

SUCCESS QUOTE

"Academic Success is directly proportional to hard work, provided that Prayers remain constant."

~ *Henry Divine*

PHYSICS 2011/12 QUESTIONS

1. Two stones P and Q of different masses were projected horizontally at different angles of 15° and 75° respectively but with the same velocity. The ranges covered by the stones will be
   A. greater for P
   B. greater for Q
   C. same for P and Q
   D. greater for the heavier of the two stones

2. If the torque on a body is zero, the angular momentum of the body will
   A. decrease continuously to zero
   B. increase then decrease to zero
   C. be constant
   D. increase continually

3. For which of the following quantities is the derived unit ML^2T^{-2} correct?
   I. Moment of force II. Acceleration
   III. Work IV. Momentum
   A. I and II **B.** I and III
   C. III and IV **D.** II only

4. In which of the following are the substances arranged in the descending order of their conductivities?
   A. copper, steel, glass
   B. steel, copper, glass
   C. copper, glass, steel
   D. glass, copper, steel

5. The *linear expansivity* of brass is $2x10^{-5}/°C$; the volume of a piece of brass 10 cm^3 at 0°C, what will be its volume at 100°C?
   A. 10.02 cm^3 B. 10.04 cm^3
   C. 10.06 cm^3 D. 10.20 cm^3

6. The thermometric property of the thermocouple is that its
   A. emf changes with temperature
   B. resistance changes with temperature
   C. volume changes with temperature
   D. resistance changes with length

7. A concave lens of focal length 20 cm forms an image ½ the size of the object. The object distance is
   A. 100 cm B. 30 cm
   C. 60 cm D. 40 cm

8. The quality of sound depends on
   A. frequency B. wavelength
   C. velocity D. harmonics

9. A student with a sight defect has a least distance of distinct vision of 150 cm. For him to read a material placed at a distance of 25 cm, what is the focal length of the glasses he should wear?
   A. 15.0 cm B. 17.0 cm
   C. 21.4 cm D. 30.0 cm

10. A dynamo primarily converts
   A. mechanical energy into electrical energy
   B. electrical energy into kinetic energy
   C. potential energy into kinetic energy
   D. kinetic energy into potential energy

11. Three capacitors 2μF, 3μF and 6μF are connected in series. If the pd across the system is 12V, the pd across the 6μF capacitor is
   A. 4V B. 6V
   C. 12V D. 2V

12. A current of 0.5A flows through a resistor when connected to a 40V battery. The energy dissipated in 2 minutes is
   A. 1200J B. 1500J
   C. 2400J D. 9600J

13. Which of the following is most strongly deflected by a magnetic field?
   A. γ-rays B. X-rays
   C. β-rays D. α- rays

14. The major difference between a semiconductor and a pure metal is that
   A. metals are harder than semiconductors
   B. the resistance of metals decreases with temperature while the reverse is the case with semiconductors
   C. the resistance of metals increases with temperature while the reverse is the case with
   D. metals have forbidden band gaps while semiconductors do not have

15. A light of energy 5 eV falls on a metal and the electrons with a maximum kinetic energy of 2 eV are ejected. The work function of the metal is
   A. 0.4eV B. 2.5 eV
   C. 3.0 eV D. 7.0 eV

BONUS TIP

Endeavor to read through the *Admission Success Tips* in this book. Read from the first one through to the last one. You may find out that you need to make one or two adjustments in certain areas to reposition yourself for a successful admission search.

PHYSICS 2011/2012 ANSWERS

1. For projectiles with a given initial speed, the maximum range is ideally attained with a projection angle of 45°. For projection angles above or below 45°, the range is shorter, and it is equal for angles equally different from 45° (for example 30° and 60°, 15° and 75°, etc).
Ans. C

2. This question is about the principle of conservation of angular momentum which states that if the net torque on a system is zero, the total angular momentum is constant. **Ans. C**

3. *Work* and *moment of force* are both obtained as the product of force and distance, i.e.
force x distance = mg x d = $kg.ms^{-2}.m$
$= kg.m^2.s^{-2} = ML^2T^{-2}$
Ans. B

4. The order of descending conductivity of metals is given thus: silver (pure), **copper** (pure), gold (pure), aluminium, zinc, nickel, brass, bronze, iron (pure), platinum, **steel** (carbonized), lead (pure), stainless steel. **Ans. A**

5. $\alpha = 2 \times 10^{-5}/°C$, $v_1 = 10cm^3$, $v_2 = ?$, $\theta_1 = 0°C$, $\theta_2 = 100°C$.
Volume expansivity, $\gamma = \frac{v_2 - v_1}{v_1(\theta_2 - \theta_1)}$ .....(*)
But $\gamma = 3\alpha = 3 \times 2 \times 10^{-5} = 6 \times 10^{-5}$
From (*), $v_2 = \gamma v_1(\theta_2 - \theta_1) + v_1$
$= 6 \times 10^{-5} \times 10 \times (100 - 0) + 10$
$= 10.06cm^3$
Ans. C

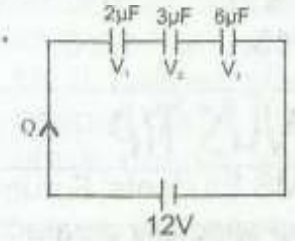
6. The thermometric property of the thermocouple is that its emf changes with temperature causing current to flow. **Ans. A**

7. f = 20cm, v = ½u or u = 2v.
$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
$\frac{1}{20} = \frac{1}{2v} + \frac{1}{v}$
$\frac{1}{20} = \frac{1+2}{2v}$
$2v = 60, v = 30$ **Ans. B**

8. The quality of a sound depends on the number of harmonics produced and their relative intensities. **Ans. D**
Compare with Question No 9 of 2010/11 (day 2)

9. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
$\frac{1}{f} = \frac{v+u}{uv}$
$f = \frac{uv}{v+v} = \frac{15 \times 150}{150 + 25}$
$= 21.43cm$
Ans. C

10. A dynamo primarily converts mechanical energy into electrical energy. **Ans. A**
Compare with Question No 11 of 2008/2009.

11.


$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$
$\frac{1}{C} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = 1$
$\longrightarrow C = 1\mu F$
But $Q = CV = 1 \times 12 = 12C$
$V = \frac{Q}{C}$
$V_3 = \frac{Q}{C_3} = \frac{12}{6} = 2V$
Ans. D

12. I = 0.5A, V = 40V, E = ?, t = 2min
Energy = Vit

= 40 x 0.5 x (2 x 60)
= 2400J **Ans. C**

13. Of all the options, β-rays is most strongly deflected by a magnetic field because it is very light and negatively charged. **Ans. C**

14. A semiconductor is a material which has electrical conductivity between that of a conductor such as copper and an insulator such as glass. The conductivity of a semiconductor increases (i.e. resistance decreases) with increasing temperature while the reverse is the case with metals. **Ans. C**

15. E = W + k.e
5 = W + 2
W = 5 - 2
W = 3.0eV

Ans. C

SUMMARY OF ANSWERS
[PHYSICS 2011/2012]

1.C	**2.**C	**3.**B	**4.**A	**5.**C
6.A	**7.**B	**8.**D	**9.**C	**10.**A
11.D	**12.**C	**13.**C	**14.**C	**15.**C

BONUS TIP

MY UNN DREAMS Students' Forum is a Facebook group specially created for admission seekers especially UNN aspirants. Do you desire to be guided and nurtured to avoid certain admission pitfalls and reposition yourself for a successful admission search? Do you want to be receiving prompt information about JAMB UTME, POST UTME and Admissions, then request to join the group. Just log on to: **www.facebook.com/groups/myunndreams**

PHYSICS 2012/13 QUESTIONS

1. The force on a current carrying conductor in a magnetic field is greatest when the
   A. conductor makes an angle of 60° with the field
   B. force is independent of the angle between the conductor and the field
   C. conductor is parallel with the field
   D. conductor is at right angles with the field

2. A magnetic field is said to exist at a point if a force is
   A. exerted on a stationary charge at that point
   B. exerted on a moving charge at that point
   C. deflected at that point
   D. strengthened at that point

3. In an a.c circuit that contains only a capacitor, the voltage lags behind the current by
   A. 90° B. 180°
   C. 30° D. 60°

4. The particle emitted when $^{39}_{19}K$ decays to $^{39}_{19}K$ is
   A. gamma B. beta
   C. electron D. alpha

5. The particle and wave nature of matter is demonstrated by
   A. Bragg's equation
   B. de Broglie equation
   C. Schrodinger equation
   D. Pauli's exclusive principle

6. The ray which causes gas molecules to glow is
   A. cathode ray B. anode ray
   C. molecular ray D. gamma ray

7. If the distance between two suspended masses 10 Kg each is tripled, the gravitational force of attraction between them is
   A. reduced by one-half
   B. increased by one-third
   C. decreased by one-third
   D. decreased by one-ninth

8. If the radius of the earth is 6.4×10^6 m, the escape velocity of a satellite from the earth is.... (take g = 10 ms^{-1})
   A. $1.13 \times 10^4 ms^{-1}$ **B.** $9.00 \times 10^3 ms^{-1}$
   C. $8.00 \times 10^3 ms^{-1}$ **D.** $1.27 \times 10^4 ms^{-1}$

9. If a body of mass 5 Kg is thrown vertically upwards with a velocity U, at what height will the potential energy equal to the kinetic energy?
   A. $h = \frac{U^2}{g}$ B. $h = \frac{U^2}{4g}$
   C. $h = \frac{2U^2}{g}$ D. $h = \frac{U^2}{2g}$

10. The rate of heat loss by a body is proportional to the
   A. difference in temperature between the body and its surrounding
   B. temperature of its surrounding
   C. ratio of the temperature of the body to that of the surrounding
   D. temperature of the body

11. In a gas experiment, the pressure of the gas is plotted against the reciprocal of the volume of the gas at constant temperature, the unit of the slope of the resulting curve is
   A. force B. temperature
   C. power D. work

12. A bar of initial length l_o is heated through a temperature range $\Delta\theta$ to a new length l. The linear expansivity of the bar is
   A. $\frac{l - l_o}{l\Delta\theta}$ B. $\frac{l - l_o}{l_o\Delta\theta}$
   C. $l_o(1+\Delta\theta)$ D. $\frac{l - l_o}{l(1+\Delta\theta)}$

13. The real depth of a pond is 6.0 m. A boy observes a fish at the bottom of the pond. What is the apparent depth if the refractive index is $^4/_3$?
   A. 8.0 m B. 5.5 m
   C. 5.0 m D. 4.5 m

14. If U is the object distance and V the image distance, which of the following expressions gives the linear magnification produced by a convex lens of focal length f?
   A. $\frac{U}{f} - f$ B. $\frac{U}{V} + f$
   C. $\frac{V}{f} + 1$ D. $\frac{V}{f} - 1$

15. A light wave has a wavelength of 500 nm in air. The frequency of the wave is
   A. 3.0×10^{14} Hz B. 6.0×10^{14} Hz
   C. 6.0×10^{12} Hz D. 2.5×10^{14} Hz

SUCCESS QUOTE

"To be successful, you must decide exactly what you want to accomplish, then resolve to pay the price to get it."

~ Bunker Hunt

YSICS 2012/2013 ANSWERS

ne force on a current carrying onductor in a magnetic field is greatest hen the conductor is at right angles ith the field. **Ans. D**
ead No 2 below for more details.

charged particle moving in a **B**-field xperiences a *sideways* force that is roportional to the strength of the agnetic field, the component of the elocity that is perpendicular to the agnetic field and the charge of the article. This force is known as the **orentz force**, and is given by

$$F = qv \times B$$

where **F** is the force, *q* is the electric charge of the particle, **v** is the nstantaneous velocity of the particle, and **B** is the magnetic field (in teslas). The Lorentz force is always perpendicular to both the velocity of the particle and the magnetic field that created it. **Ans. B**

n an a.c circuit that contains only a capacitor, the voltage lags behind the current by 90°. **Ans. A**
For more details, go to Question No 11 of 2006/2007.

Note the following carefully:

- **Alpha particles** are doubly charged (+2*e*) particles containing two protons and neutrons. They are identical to the nucleus of helium atom (^4_2He).
- **Beta particles** are electrons.
- **Gamma rays** are particles or quanta, or photons, of electromagnetic energy.

n gamma decay, the mass and proton numbers do not change. The daughter nucleus is simply the parent nucleus with less energy. **Ans. A**

5. Louis de Broglie proposed that a particle of mass *m* traveling with a velocity *v* would have a wavelength given by the equation: $\lambda = \frac{h}{mv}$ where *h* is the Planck constant.
Ans. B

6. Cathode ray causes gas molecules and flourescent materials to glow.
Ans. A

7. The relationship between the gravitational force of attraction two masses and the distance between them is an inverse relationship. It is otherwise referred to as the inverse square law and is given thus: $F \propto \frac{1}{r^2}$ where F is the gravitational force of attraction and r is the distance between the masses. Considering the relation, if r is tripled, F would decrease by one-ninth. **Ans. D**

8. $R = 6.4 \times 10^6 m$, $g = 10 ms^{-2}$
escape velocity, $v_e = \sqrt{2Rg}$
$= \sqrt{2 \times 6.4 \times 10^6 \times 10}$
$= 1.13 \times 10^4 ms^{-1}$
Ans. A

9. To obtain the height, we equate potential energy to kinetic energy.
Potential energy, PE = Kinetic energy, KE
$mgh = \frac{1}{2}mu^2$

Ans. D

10. The rate of heat loss of a body is proportional to the difference in temperature between the body and its surrounding. This is Newton's law of cooling. **Ans. A**

11. Pressure = Nm^{-2}, Volume = m^3

$\frac{\text{Pressure}}{\frac{1}{\text{Volume}}}$ = pressure x volume

= $Nm^{-2} \times m^3 = Nm$

= force x distance = work

The unit is that of work.

Ans. D

12. The linear expansivity of a metal is defined as the increase in length per unit length per degree Celsius rise in temperature. **Ans. B**

13. real depth = 6.0m, apparent depth = ?, refractive index = 4/3.

But refractive index = $\frac{\text{real depth}}{\text{apparent depth}}$

$\Longrightarrow$ apparent depth = $\frac{\text{real depth}}{\text{refractive index}}$

$= \frac{6}{4/3} = 4.5m$

Ans. D

14. Object distance = U, Image distance = V

Magnification, $M = \frac{V}{U} = V\left(\frac{1}{U}\right)$

From lens formula, $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$; we have

$\frac{1}{u} = \frac{1}{f} - \frac{1}{v}$

$\Longrightarrow M = V\left(\frac{1}{f} - \frac{1}{v}\right) = \frac{v}{f} - \frac{v}{v} = \frac{v}{f} - 1$

Ans. D

15. wavelength, □ = 500nm = 500×10^{-9}m, vel. of light, $c = 3 \times 10^8 ms^{-1}$

frequency, f = ?

but $c = f\square \Longrightarrow f = \frac{c}{\square}$

$f = \frac{3 \times 10^8}{500 \times 10^{-9}} = 6 \times 10^{14} Hz$

Ans. B

SUMMARY OF ANSWERS

[PHYSICS 2012/2013]

1.D	2.B	3.A	4.A	5.B
6.A	7.D	8.A	9.D	10.A
11.D	12.B	13.D	14.D	15.B

PHYSICS 2012/13 QUESTIONS

[DE]

1. The ratio of electrostatic force F_E to gravitational force F_G between two protons each of charge e and mass m, at a distance d is

A. $\frac{e}{4\pi\varepsilon_0 Gm}$ B. $\frac{e^2}{Gm^2}$

C. $\frac{Gm^2}{4\pi\varepsilon_0 e^2}$ D. $\frac{e^2}{4\pi\varepsilon_0 Gm^2}$

2. The energy stored in an inductor of inductance 5mH when a current of 6A flows through it is

A. 9.0×10^{-3}J B. 9.0×10^{-2}J

C. 1.4×10^{-2} J D. 1.8×10^{-2} J

3. An electric heater with a pd of 240V connected across its terminals has a total resistance of 960Ω. Calculate power range of the heater

A. 0.25 W B. 4.00 W

C. 38.40 W D. 60.00 W

4. The time it will take a certain radioactive material with a half-life of 50 to reduce to $\frac{1}{32}$ of its original number is

A. 250 days B. 150 days

C. 300 days D. 200 days

5. The unit of moment of a couple can be expressed in

A. Nm^{-1} B. Nm^{-2}

C. Nm D. Nm^2

6. The resultant of two forces 12N and 5N is 13N. What is the angle between the two forces?

A. 0° B. 45°

C. 90° D. 180°

A body of mass 12Kg traveling at $4.2ms^{-1}$ collides with another body of mass 18Kg at rest. Calculate their common velocity if the two bodies coalesce after collision.

A. $1.5ms^{-1}$ B. $1.4ms^{-1}$
C. $2.1ms^{-1}$ D. $1.7ms^{-1}$

. When left in a freezer, a bottle full of water cracks on freezing into ice because of the

A. increase in the volume of water
B. contraction of the bottle
C. expansion of the bottle
D. decrease in the volume of water

. At constant pressure, the density of a given gas is

A. constant with temperature
B. proportional to its volume
C. inversely proportional to its temperature
D. independent on its volume

0. When the vapour of a substance is in equilibrium with its own liquid, it is said to be

A. gaseous B. liquified
C. diffused D. saturated

1. If the pressure of $100cm^3$ of an ideal gas is doubled while its Kelvin temperature is halved, then the new volume of the gas is

A. $25cm^3$ B. $50cm^3$
C. $100cm^3$ D. $200cm^3$

2. The eye controls the amount of light reaching the retina by adjusting the

A. cornea B. iris
C. retina D. optic nerve

13. Transverse waves can be distinguished from longitudinal waves using the characteristics of

A. diffraction B. refraction
C. polarization D. reflection

14. The production of pure spectrum could easily be achieved using

A. a glass prism with a pin
B. triangular prism with two convex
C. triangular prism only
D. triangular prism with two concave lenses

15. When the length of a vibrating string is reduced by one-third, its frequency becomes

A. three times its former value
B. twice its former value
C. one-third its former value
D. one-sixth its former value

DONT FORGET

SURE SUCCESS is more than just a book. It's a Divine Project. Don't fall into the temptation of photocopying or preparing with a photocopy of the book. You may be sowing the seed for your frustration in life.

PHYSICS 2012/2013 ANSWERS [DE]

1. Electrostatic force = $F_E = \frac{e^2}{4\pi\varepsilon_0 d^2}$

Gravitational force = $F_G = \frac{Gm^2}{d^2}$

$$\frac{F_E}{F_G} = \frac{\frac{e^2}{4\pi\varepsilon_0 d^2}}{\frac{Gm^2}{d^2}} = \frac{e^2}{4\pi\varepsilon_0 d^2} \times \frac{d^2}{Gm^2}$$

$$= \frac{e^2}{4\pi\varepsilon_0 Gm^2}$$

Ans. D

2. $L = 5mH = 5 \times 10^{-3}$, $I = 6A$,

Energy, $W = \frac{1}{2}LI^2 = \frac{1}{2} \times 5 \times 10^{-3} \times 6^2$

$= 9.0 \times 10^{-2}$ J

Ans. B

3. pd, $V = 240V$, Resistance, $R = 960\Omega$

Electric power = $\frac{V^2}{R} = \frac{240^2}{960} = 60W$

Ans. D

4. The fraction of a radioactive material with n half-lives is given by $(\frac{1}{2})^n$. But from the question, the fraction is $\frac{1}{32}$.

This implies that $(\frac{1}{2})^n = \frac{1}{32}$

$2^{-n} = 32^{-1}$

$2^{-n} = 2^{-5}$

Equating the powers, we have n = 5 i.e.

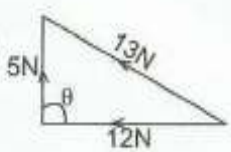
Number of half-life = 5

Total time taken = No of half-life x half-life

$= 5 \times 50 = 250$days

Ans. A

5. The moment of couple is obtained as the product of force and distance. The unit is Newton-meter (Nm). **Ans. C**

6. 

Using cosine rule,

$\text{Cos}\theta = \frac{a^2 + b^2 - c^2}{2ab}$

$\text{Cos}\theta = \frac{12^2 + 5^2 - 13^2}{2 \times 12 \times 5}$

$\text{Cos}\theta = 0$

$\theta = \text{Cos}^{-1}(0) = 90°$

Ans. C

7. mass of first body (m_1) = 12kg

velocity of first body (v_1) = 4.2m/s

mass of the second body (m_2) = 18kg

velocity of the second body (v_2) = 0m/s

$m_1v_1 + m_2v_2 = (m_1 + m_2)v$

$(12 \times 4.2) + 18 \times 0 = (12 + 18)v$

$50.4 = 30v$, $v = 1.7$m/s

Ans. D

8. One of water's most remarkable properties is that it expands when it freezes to a volume that is always 10% greater than in the liquid state. In other words, 10 cups of water put into the freezer is going to turn into 11 cups of ice when it freezes. This expansion takes place with tremendous force, enough to burst the strongest water bottles if the water in them freezes.

Ans. A

9. The density of gases depends upon the temperature. The higher the temperature, the more the molecules are spread out and the lower the. density, provided that pressure is kept constant. In other words, there is an inverse relationship between the temperature of a given mass of gas and its density at constant pressure. **Ans. C**

10. When the vapour of a substance is in equilibrium with its own liquid, it is said to be saturated. Any addition of thermal energy to a saturated liquid will cause it to vaporize. Any subtraction of thermal energy from a saturated vapour will cause it to condense. **Ans. D**

11. $P_1 = P$, $V_1 = 100cm^3$, $T_1 = T$, $P_2 = 2P$, $T_2 = \frac{1}{2}T$, $V_2 = ?$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$\frac{P \times 100}{T} = \frac{2P \times V_2}{T}$$

$$V_2 = \frac{P \times 100 \times T}{T \times 2P} = 50cm^3$$

Ans. B

12. The iris is a thin, circular structure in the eye, responsible for controlling the diameter and size of the pupils and thus the amount of light reaching the retina. **Ans. B**

13. Note the following:
    (i) In a longitudinal wave, the motion of the medium is parallel to the direction of the wave . This means that the particles move left and right which in turn makes the other particles start to oscillate. Sound waves are longitudinal waves.
    (ii) A transverse wave is a wave in which the motion of the medium is at right angles to the direction of the wave. A wave on a rope is a transverse wave. Light and other electromagnetic waves are also transverse waves.

    If the vibrations of a transverse wave are in one plane only, then that wave is said to be plane-polarized. Longitudinal waves cannot be plane-polarized.

    Ans. C

14. A spectrum can be pure or impure. The latter is one in which light of one wavelength overlaps the adjacent wavelength. The former is the one in which each color gives a sharp impression, as the wavelengths do not overlap. An instrument used for producing a pure spectrum is a spectrometer though production of pure spectrum could also be achieved using a triangular prism and two convex lenses. **Ans. B**

15. There is an inverse relationship between the length of a vibrating string and the frequency of the note emitted (as long as the tension and the mass per unit length are kept constant). This implies that if the length is reduced by one-third, the frequency becomes three times its former value. **Ans. A**

SUMMARY OF ANSWERS

[PHYSICS 2012/2013 (DE)]

1.D	2.B	3.D	4.A	5.C
6.C	7.D	8.A	9.C	10.D
11.B	12.B	13.C	14.B	15.A

SUCCESS QUOTE

"Learning is the beginning of wealth. Learning is the beginning of health. Learning is the beginning of spirituality. Searching and learning is where the miracle process all begins."

~ Jim Rohn

CHEMISTRY

Don't deny what you are feeling.
You are experiencing anxiety because you realize the importance of passing this exam—it's a natural reaction.
However, don't let this fear paralyze you.
Visualize your Success and Tame your Fears!!

CHEMISTRY 2005/06 QUESTIONS

Which of the following is a mixture?
A. Sodium chloride
B. Sea water
C. Iron filings
D. Granulated sugar

. Two elements, X and Y, have atomic numbers 8 and 13 respectively. The formula for the possible compound found between X and Y is
A. Y_2X_3 B. XY_2
C. X_3Y_2 D. X_2Y_3

. 3 g of a mixture of CaO and $CaCO_3$ was heated to a constant mass. If 0.44 g of CO_2 was liberated, calculate the percentage of CaO in the mixture.
A: 33.3% B. 50%
C. 66.67% D. 25%

. An alkanoic acid has a molecular mass of 88. Its molecular formula is
A. C_4H_9COOH B. $C_5H_{11}COOH$
C. C_3H_5COOH D. C_3H_7COOH

. If the rate of diffusion of oxygen is taken as 1 cm^3s^{-1}, what will be the rate of diffusion of methane whose relative molecular mass is 16?
A. 2.0 B. 1.8
C. 1.4 D. 1.0

. An increase in temperature causes an increase in the pressure of a gas in a fixed volume due to an increase in the
A. Number of molecules of the gas
B. Density of the gas molecules
C. Number of collisions between the gas molecules
D. Number of collisions between the gas molecules and the walls of the container

7. In electrolysis, the chemical reaction which takes place at the anode is
A. dissociation B. hydrolysis
C. oxidation D. reduction

8. In the electrolysis of brine, it is essential to prevent the mixing of the products because
A. sodium and chlorine readily combine
B. chlorine gives a green coloration
C. chlorine readily recombines with sodium hydroxide
D. sodium hydroxide forms a carbonate in the presence of air and chlorine

9. In what way is equilibrium constant for the forward reaction related to that of the reverse reaction?
A. The two equilibrium constants are identical
B. The product of the two is always greater than one
C. The product of the two is expected to be one
D. The addition of the two is expected to be one

10. When chlorine water is exposed to sunlight, the gas evolved is
A. Cl_2 B. O_2
C. HCl D. CO_2

11. $PbCl_2$ does not dissolve in liquid ammonia while AgCl does. This is because
A. Pb is not a transition metal while Ag is
B. Ag is not a transition metal while Pb is
C. AgCl turns grey on exposure to light
D. AgCl dissolves in hot water

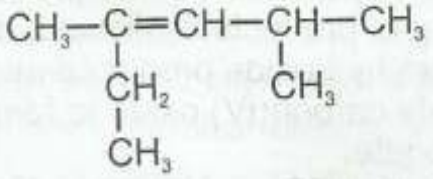
12. When sodium hydroxide pellets are exposed to the atmosphere, the first

gas they absorb is

A. CO_2 B. Water vapour

C. Oxygen D. Nitrogen

13. What is the IUPAC name of the hydrocarbon?



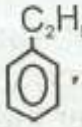
A. 2-ethyl-4-methyl pent-2-ene
B. 3,5 dimethyl hex-3-ene
C. 2,4-dimethyl hex-3-ene
D. 3-methyl 2-ethyl hex-2-ene

14. Which of the following is NOT a monomer of benzene?

A.

B. $CH_2=CH_2$

C. $CH_2=CHCl$

D. 

15. Which of the following behaves like ethyne?

A. $CH_3CH=CHCH_3$
B. $CH_3CH_2CH_2CH_2CH=CH_2$
C. $CH_2=CH_2$
D. CH_3CH_3

SUCCESS QUOTE

"The same excuses that many give for their failure are the same excuses that propel others to great heights. What a paradox!"
- Arnold H Huxley

CHEMISTRY 2005/06 ANSWERS

1. A mixture is a material system made up by two or more different substances which are mixed together but are not combined chemically. It is the physical combination of two or more substances the identities of which are retained and are mixed in the form of alloys, solutions, suspensions and colloids. Sodium chloride is a compound chemically produced. Sea water is a mixture of sand, water and salts. Iron filings is an element existing alone. Granulated sugar is a simple compound. **Ans. B**

2. Recall that the valency of an element is the combining power of the element. An element X with atomic number 8 is a non-metal with a valency of -2 while an element Y with atomic number 13 is a metal with a valency of +3. When X and Y combine, their valencies are interchanged to form the compound: Y_2X_3. **Ans. A**

3. $CaCO_3 \rightarrow CaO + CO_2$
   100 g of $CaCO_3$ = 44 g of CO_2
   1 g of $CaCO_3$ = 0.44 g of CO_2
   Therefore, 1 g of $CaCO_3$ is in the mixture.
   Percentage of CaO = $\frac{3 - 1}{3} \times 100\%$
   $= \frac{2}{3} \times 100\%$
   $= 66.67\%$
   Ans. C

4. Recall that alkanoic acids form a homologous series with the general molecular formula of $C_nH_{2n+1}COOH$. From the general formula, we have

that

$(12\times n) + [1\times(2n+1)] + 12 + 16 + 16 + 1 = 88$

$12n + 2n + 1 + 45 = 88$

$14n + 46 = 88$

$14n = 88 - 46 = 42$

$n = \frac{42}{14} = 3$

We therefore obtain the molecular formula by substituting for *n* in the general formula, i.e. C_3H_7COOH

Ans. D

5. $\frac{R_O}{R_M} = \sqrt{\frac{D_M}{D_O}}$

$\frac{1}{R_M} = \sqrt{\frac{16}{32}}$

$R_M = \sqrt{\frac{32}{16}} = 1.41$

Ans. C

6. According to the kinetic theory of gases, the gas molecules move randomly in straight lines, colliding with one another and with the walls of the container. These collisions constitute the gas pressure. An increase in temperature leads to an increase in the kinetic energy of the gas particles, an increase in the frequency (or number) of collisions and an increase pressure.

Ans. D

7. The anode is the positive electrode which is connected to the positive terminal of the electric source. It is the electrode through which electrons leave the electrolyte. Loss of electron is oxidation.

Ans. C

8. Note that brine is the name given to sodium chloride solution. The industrial process for the electrolysis of brine is referred to as the *chloroalkali process*. Depending on the method used, several products besides *hydrogen* can be produced. If the products are prevented from mixing, *chlorine* and *sodium hydroxide* are the products. If mixing of products is allowed, the sodium hydroxide produced attacks liberate carbon(IV) oxide to form carbonate.

$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

Ans. D

9. Equilibrium constant is defined as the ratio of the rate of forward reaction to that of backward reaction. In writing equilibrium constant for forward reactions, the products are placed as the numerator while the reactants are placed as the denominator. In writing reverse or backward equilibrium constant, reactants form the numerator while products form the denominator. Consider the "reaction" below:

$x(\text{Reactants}) \rightleftharpoons y(\text{Products})$

If

Forward equilibrium constant = K_c

Reverse equilibrium constant = K_{c1}

Then,

$K_c = \frac{[\text{Products}]^y}{[\text{Reactants}]^x}$ $K_{c1} = \frac{[\text{Reactants}]^x}{[\text{Products}]^y}$

This shows that the equilibrium constant of the forward reaction is the inverse (or opposite) of that of the reverse reaction. That is, $K_c = \frac{1}{K_{c1}}$

$\rightarrow K_c \times K_{c1} = 1$

Therefore, the product of the two is expected to be one.

Ans. C

10. Note that chlorine water is the name given to a solution of chlorine. Under

the action of light, chlorine water gives oxygen and hydrochloric acid.

$$HOCl \rightarrow HCl + \tfrac{1}{2}O_{2(g)}$$

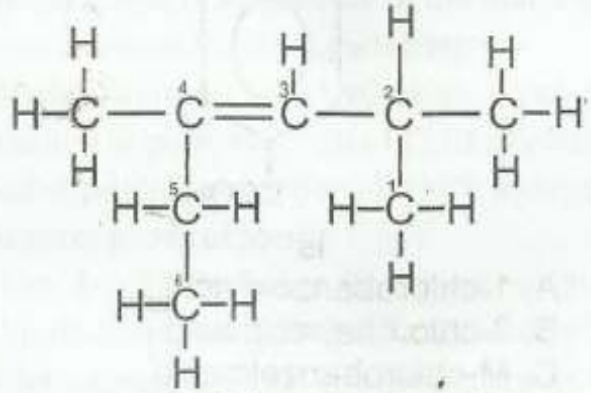
Ans. B

11. **Ans. A**

12. Sodium hydroxide is a white, crystalline solid. It is deliquescent and melts at about 320°C without decomposing. It readily absorbs carbon(IV) oxide (a weak acidic oxide) to form sodium trioxocarbonate(IV).

Ans. A

13.



2,4-dimethyl hex-3-ene

Ans. C

14. **Ans. C**

15. **Ans. C**

SUMMARY OF ANSWERS
[CHEMISTRY 2005/06]

1.B	**2.**A	**3.**C	**4.**D	**5.**C
6.D	**7.**C	**8.**D	**9.**C	**10.**B
11.A	**12.**A	**13.**C	**14.**C	**15.**C

SUCCESS QUOTE

"Vision without action is a daydream!!"
~ Japanese proverb

CHEMISTRY 2006/07 QUESTIONS

Indicate the correct option in each of the following questions

1. A mixture of iron and sulphur can be separated by dissolving the mixture in
   A. Steam
   B. Dilute hydrochloric acid
   C. Dilute sodium hydroxide
   D. Benzene

2. If 67.5 g of oxide of lead was reduced to 61.2 g of metal, calculate the formula of the oxide. (Pb = 207, O = 16)
   A. PbO B. PbO_3
   C. Pb_3O_4 D. Pb_2O_3

3. Calculate the minimum volume of the oxygen that is required for complete combustion of a mixture of 20 cm^3 of CO and 10 cm^3 of hydrogen.
   A. 5 cm^3 B. 10 cm^3
   C. 15 cm^3 D. 20 cm^3

4. $HNO_3 + H_2O \rightleftharpoons H3O^+ + NO_3^-$
   In the reaction above, NO_3^- is the
   A. Conjugate acid B. Acid
   C. Conjugate base D. Base

5. The pH range of a neutralization product of CH_3COOH and KOH is
   A. 1 - 3 B. 7 - 8
   C. 6 - 7 D. 12 - 14

6. How much NaOH is required to make 250 cm^3 of 0.1 mol/dm^3 solution?
   A. 10 g B. 1.0 g
   C. 0.1 g D. 4 g

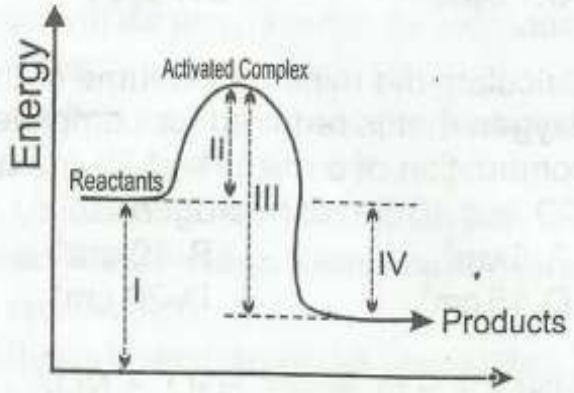
7. $2PbO_2 \rightarrow 2PbO + O_2$
   In the equation above, the oxidizing agent is

A. Pb^{4+} B. Pb^{2+}
C. O^{2-} D. O_2

8. A current of 0.5 A flows for 1930 seconds and deposits 0.325 g of metal M. If the charge is +2, the relative molecular mass is
A. 65 g B. 32 g
C. 24 g D. 40 g

9. Emission of chlorofluorocarbon (CFC) into the atmosphere causes
A. global warming
B. acid rain
C. depletion of ozone layer
D. greenhouse effect

10.



The diagram above shows the reaction path of an exothermic reaction. The heat of reaction is represented by
A. I B. II
C. III D. IV

11. Which of the following samples will react fastest with dilute HCl?
A. 10 g of lumps of $CaCO_3$ at 25 °C
B. 10 g of powdered $CaCO_3$ at 25 °C
C. 10 g of lumps of $CaCO_3$ at 50 °C
D. 10 g of powdered $CaCO_3$ at 50 °C

12. The colour exhibited by copper in a flame test is
A. green B. lilac
C. blue-green D. crimson

13. Which of the following statements is correct?
A. Chlorine bleaches by oxidation while sulphur(IV) oxide bleaches by reduction
B. Chlorine bleaches by reduction while sulphur(IV) oxide bleaches by oxidation
C. Both of them bleach by oxidation
D. Both of them bleach by reduction

14. The IUPAC name for

is
A. 1-chlorobenzoic acid
B. 3-chlorobenzoic acid
C. M-chlorobenzoic acid
D. P-chlorobenzoic acid

15. 2-methylbut-2-one is an isomer of
A. Pent-1-ene
B. 2-methylpent-2-one
C. Hex-3-ene
D. 2-methylprop-1-ene

SUCCESS QUOTE

"Being defeated is often a temporary condition. Giving up is what makes it permanent."
~ Marlene vos Savant

CHEMISTRY 2006/07 ANSWERS

1. Both iron and sulphur attack steam to form oxides. Iron reacts very slowly with dil. HCl to liberate hydrogen while sulphur dissolves in dil. HCl to form sulphide. Both have no reaction with benzene. Sulphur reacts with sodium hydroxide to form sodium sulphide but iron has no reaction with sodium hydroxide. Hence, a mixture of iron and sulphur can be separated by dissolving the mixture in dil. NaOH.

Ans. C

2. Mass of oxide of lead = 67.5 g
Mass of metal = 61.2 g
Mass of oxygen = 67.5 - 61.2 = 6.3 g

Element	Pb	:	O
Relative mass	61.2g		6.3g
Mole ratio = Reacting mass / Molar mass	61.2/207 = 0.3		6.3/16 = 0.4
Mole ratio / Smallest mole ratio (i.e. 0.3)	1	:	1.33 ≈ 1

Therefore, the formula of the oxide is PbO.

Ans. A

3. $2CO + O_2 \rightarrow 2CO_2$
$2 : 1 : 2$
$20cm^3 : 10cm^3 : 20cm^3$
$10cm^3$ of O_2 is needed.
$2H_2 + O_2 \rightarrow 2H_2O$
$2 : 1 : 2$
$10cm^3 : 5cm^3 : 10cm^3$
$5cm^3$ of O_2 is needed.
Total O_2 needed = $10cm^3 + 5cm^3 = 15cm^3$

Ans. C

4. Considering the reverse reaction, we notice that NO_3^- can gain a proton from H_3O^+. Hence, it is the conjugate base.

Ans. C

5. Note that the two neutralization products of CH_3COOH and KOH are CH_3COOK and H_2O i.e. salt and water.
$CH_3COOH + KOH \rightarrow CH_3COOK + H_2O$
CH_3COOK is a salt of weak acid and strong base. The salt will be basic when dissolved in water because the strengths of acid and base are not equal. Therefore, CH_3COOK when dissolved in water will have all the properties of KOH (a base). **Ans. D**

6. $g/dm^3 = mol/dm^3 \times$ molar mass
g/dm^3 = mass conc. = $0.1 mol/dm^3 \times 40 g/mol$
$= 4 g/dm^3$
Recall that $1 dm^3 = 1000 cm^3$.
This implies that,
4 g of NaOH is needed for $1000 cm^3$
X g of NaOH is needed for $250 cm^3$
$\rightarrow X = \frac{4 g \times 250 cm^3}{1000 cm^3} = 1 g$

Ans. B

7. Considering redox in terms of Oxygen, we note that a species is said to have been reduced if it loses oxygen from left to right of an equation. This reduced species is also the oxidizing agent.
In another way, the oxidizing agent is usually defined as the oxygen donor while the oxygen acceptor is the reducing agent. So the oxidized species is the one that gains oxygen from left to right of an equation.
In the given equation, the reduced species is Pb^{4+} (i.e. from Pb^{4+} to Pb^{2+}); hence, it is the oxidizing agent.

Ans. A

8. i =0.5A, t =1930s, m =0.325g, valency =+2
1 mole = 1 Farad × valency
where 1 Farad = 96500 C

1 mole of metal = 96500 × 2 = 193,000 C
But 0.325 g of metal = it
= 0.5 × 1930 = 965 C
i.e. 0.325 g of metal = 965 C
x = 193,000 C
$x = \frac{0.325 \times 193{,}000}{965}$
x = 65 g

Ans. A

9. $O_3 + Cl^{\cdot} \rightarrow ClO_2 + O^{2\cdot}$
(from CFC)

Ans. C

10. Heat of reaction is the amount of heat evolved or absorbed when a chemical reaction occurs between molar quantities of the substances as represented in the equation of reaction under standard conditions.

Ans. D

11. At high temperatures, rate of reaction is high and powdered reactants provide greater surface area for reactions.

Ans. D

12. All copper(II) salts impart a characteristic bluish-green colour to a non-luminous flame.

Ans. C

13. **Ans. A**

14. **Ans. A**

15. **Ans. A**

SUMMARY OF ANSWERS
[CHEMISTRY 2006/07]

1.C	2.A	3.C	4.C	5.D
6.B	7.A	8.A	9.C	10.D
11.D	12.C	13.A	14.A	15.A

CHEMISTRY 2007/08 QUESTIONS

1. Two immiscible liquids with different boiling points can be separated by
   A. the use of separating funnel
   B. evaporation
   C. distillation
   D. decantation

2. A mixture of $CaCl_2$ and $CaCO_3$ in water can be separated by
   A. evaporation B. sublimation
   C. distillation D. decantation

3. Consider the reaction represented by
   $xPb(NO_3)_2 \rightarrow 2PbO + yNO_2 + zO_2$
   What are the values of x, y and z respectively?
   A. 2, 6, 3 B. 1, 4, 2
   C. 2, 4, 1 D. 2, 4, 2

4. 20 cm^3 of H_2 mixed and separated with 100 cm^3 of air containing 21% O_2. Calculate the volume of the residual gases at 110 °C.
   A. 31 cm^3 B. 11 cm^3
   C. 90 cm^3 D. 110 cm^3

5. What is responsible for metallic bonding?
   A. Sharing of electrons between the metal atoms
   B. Attraction between the atomic nuclei and the cloud of electrons
   C. Transfer of electrons from one atom to another
   D. Attraction between positive and negative ions

6. 25 cm^3 of 1.5 M solution of NaCl are added to 50 cm^3 0f 3 M NaCl. The molar concentration of the resulting solution is
   A. 2.5 M B. 3 M
   C. 2.25 M D. 4.5 M

7. A solution of salt formed from HCl and NH_3 solutions is
   A. acidic
   B. basic
   C. complex
   D. neutral

8. Which of the following elements will burn in excess oxygen to form a product that is neutral to litmus?
   A. Carbon
   B. Hydrogen
   C. Sulphur
   D. Sodium

9. A current was passed for 10 mins and 0.2 mole of Cu was deposited. How many grammes of Ag will it deposit? (Cu = 64, Ag = 108)
   A. 43.2g
   B. 21.6g
   C. 10.8 g
   D. 5.4 g

10. Pollution of underground water by metal ions is very likely in a soil that has high
   A. acidity
   B. alkalinity
   C. chloride content
   D. nitrate content

11. Producer gas is a gas with low calorific value because it contains more
   A. CO_2 than O_2
   B. N_2 than CO
   C. CO_2 than N_2
   D. N_2 than CO_2

12. For most reversible reactions,
   A. the reaction rate increase with time
   B. the reaction rate decreases with time
   C. the rate stabilizes with time
   D. the rate produces a curve with time

13. Which of the following compounds will leave a metal residue when heated?
   A. $Cu(NO_3)_2$
   B. $AgNO_3$
   C. K_2CO_3
   D. Na_2CO_3

14. Which of the polymers contains nitrogen?
   A. Nylon
   B. PVC
   C. Polyethene
   D. Cellulose

15. A red precipitate of copper(I) dicarbide is formed when ammonium solution of copper(I) chloride is introduced into
   A. $CH_2=CH-CH_2-CH_3$
   B. $CH_3-CH_2-C\equiv CH$
   C. $CH_3-CH_2-CH_2-CH_3$
   D. $CH_3-C\equiv C-CH_3$

FEATURES OF THIS BOOK

- **Quick Subject Revision Aids**
- **Admission Success Secrets**
- **Bonus Tips**
- **Success Quotes**
- **Answers to Frequently Asked Questions (FAQ's)**

In the *Quick Subject Revision Aids*, efforts were made to highlight the basic concepts of the subjects and to provide insights into the likely examination questions. The *Admission Success Secrets* are geared towards solving the problem of lack of admission orientation among candidates and providing answers to their *Frequently Asked Questions*.

The *Bonus Tips* provide you with those extra information you need to have an edge over others. *Success Quotes* were also included to get you motivated, because if you are motivated, then you are already half-way to your success.

If you can't find the above features in the material you bought, please call 08060848179 to get an original copy of SureSuccess. God bless you.

CHEMISTRY 2007/2008 ANSWERS

1. Note the following:
- *Separating funnel* is used to separate *immiscible liquids* (e.g. oil and water).
- *Evaporation* (to dryness) is used to recover a *solid solute from a solution.*
- *Distillation* is used to recover a *solvent from a solution.*
- *Decantation* is used to separate *insoluble solid from a liquid.*

Ans. A

2. **Ans. D** - decantation

3. $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$
   2 : 2 : 4 : 1
   Ans. C

4. Volume of $O_2 = \frac{21.0}{100} \times \frac{100}{1} = 21\ cm^3$
   Volume of N_2, H_2 and others = $100 - 21 = 79\ cm^3$
   $2H_2 + O_2 \rightarrow 2H_2O$
   2 : 1 : 2
   20 : 21 : -
   20 : 10 : 20
   Vol. of excess $O_2 = 21 - 10 = 11\ cm^3$
   Therefore, vol. of residual gas = 20 + 11 + 79
   $= 110\ cm^3$
   Ans. D

5. Metallic bonding is the electrostatic attractive forces between the delocalized electrons (called conduction electrons) gathered in an "electron sea/cloud" and the positively charged metal ions.
   Ans. B

6. $\frac{25}{1000}\ dm^3 \times 1.5\ \frac{mol}{dm^3} = 0.0375 moles$
   $\frac{50}{1000}\ dm^3 \times 3\ \frac{mol}{dm^3} = 0.15 moles$
   Total amount = (0.0375 + 0.15) moles
   = 0.1875 moles
   Total volume of NaCl = $25\ cm^3 + 50\ cm^3$
   $= 75 cm^3$
   → 0.1875 moles of NaCl was added to $75\ cm^3$
   How much was added to $1000 cm^3$?
   i.e. $\frac{0.1875\ mole \times 1000\ cm^3}{75 cm^3} = 2.5\ mol/dm^3$
   = 2.5M
   Ans. A

7. A solution of salt formed by strong acid and weak base will posses all the properties of an acid. HCl is a strong acid, NH_3 is a weak alkaline gas. The salt formed will be acidic in nature.
   $HCl + NH_3 \rightarrow NH_4Cl$
   Ans. A

8. It is only hydrogen that can burn in excess air (oxygen) to form a neutral compound which is water.
   $2H_2 + O_2 \rightarrow 2H_2O$
   excess neutral to litmus
   Ans. B

9. 1 mole = 1 Farad × valency
   where 1 Farad = 96500 C
   1 mole of Cu = 96500 × 2 = 193,000 C
   0.2 mole of Cu = 193,000 × 0.2 = 38600 C
   But 1 mole of Ag = 108 g
   → 108 g of Ag = 96500 × 1 = 96500 C
   Therefore, since
   96500 C = 108 g of Ag
   38600 C = $\frac{108 \times 38600}{96500}$ = 43.2 g of Ag
   Ans. A

10. Pollution of underground water by metal ions is very likely in a soil that has high *nitrate content*. There is a rule in Chemistry that says that all nitrates are soluble. So if a soil has a high metallic nitrate content, dissolution in water will give the ions of the metal. **Ans. D**

11. Producer gas, also called air gas, is a combustible mixture of nitrogen, carbon monoxide and hydrogen. It is generated by passing air with steam over burning coke or coal in a furnace.

It is used as fuel.

Ans. B

12. At the start of a reversible reaction, the forward reaction is usually faster than the backward reaction. But as time goes on, the backward reaction levels up, leading to a condition known as equilibrium. **Ans. C**

13. When heated, silver trioxonitrate(V) decomposes to silver, oxygen and brown fumes of nitrogen(IV) oxide.
$2AgNO_{3(s)} \rightarrow 2Ag_{(s)} + O_{2(g)} + 2NO_{2(g)}$
Ans. B

14. The nylons are a family of polymers, members of which have subtly different properties that suit them to one use or another. There are many types of nylon. In nylon 6.6, the two monomers are hexane-1,6-diamine, $H_2N\text{-}(CH_2)_6\text{-}NH_2$, and hexanedioic acid, $COOH\text{-}(CH_2)_4\text{-}COOH$. In general, the molecules of nylons contain the recurring amide group CONH. **Ans. A**

15. **Ans. D**

SUMMARY OF ANSWERS (CHEMISTRY 2007/08)

1.A	**2.**D	**3.**C	**4.**D	**5.**B
6.A	**7.**A	**8.**B	**9.**A	**10.**D
11.B	**12.**C	**13.**B	**14.**A	**15.**D

SUCCESS QUOTE

"Do not lower your goals to the level of your abilities. Rather, raise your abilities to the height of your goals. Learn to dream big and take responsibility for the actualization of your dreams!!"

~ Henry Divine

CHEMISTRY 2008/2009 QUESTIONS

1. What are the values of p, q, r and s respectively in the equation?
$pCH_4 + qO_2 \rightarrow rCO + sH_2O$
A. 1, 2, 1, 2 B. 1, 3, 2, 2
C. 2, 3, 2, 4 D. 2, 3, 2, 2

2. $KHCO_3$ is contaminated with K_2CO_3 as impurity. If 2.5 g of the impure $KHCO_3$ on heating produces 0.224 dm^3 of CO_2 at s.t.p., calculate the percentage of K_2CO_3 impurity. (K = 39, H = 1, C = 12, O = 16)
A. 30% B. 40%
C. 10% D. 20%

3. The partial pressure of N_2 in a container at 50 °C in which there are 0.30 mole of N_2 and 1.2 mole of CO_2 at a pressure of 2.00 atm is?
A. 0.6 atm B. 0.5 atm
C. 0.4 atm D. 1.6 atm

4. The major reason why chemical reaction occurs among elements is that they have the tendency to
A. attain the nearest noble gas structure
B. become a metal
C. become a non-metal
D. become a noble element

5. Given that the pH of a solution of KOH is 12, what is the concentration of the OH^- ions?
A. 0.01 mol/dm^3
B. 1×10^{-12} mol/dm^3
C. 1×10^{-14} mol/dm^3
D. 1×10^{-7} mol/dm^3

6. Which of the following salt has a pH less than 7?
A. $NaHCO_3$ B. NH_4Cl
C. Na_2SO_4 D. NaCl

Call any of the numbers: {08060848179, 08094384850, 07059643560, 08081611811} to get your copy.

. In which of the following reactions does hydrogen peroxide act as a reducing agent?
A. $PbO_2+2HNO_3+H_2O_2 \rightarrow Pb(NO_3)_2+2H_2O+O_2$
B. $H_2S + H_2O_2 \rightarrow S + 2H_2O$
C. $PbSO_2 + H_2O_2 \rightarrow PbSO_4 + H_2O$
D. $2I^- + 2H^+ + H_2O_2 \rightarrow I_2 + 2H_2O$

. Temporary hardness of water is removed by the use of the following EXCEPT
A. Boiling
B. Use of $Ca(OH)_2$
C. Use of Na_2CO_3
D. Use of alum

. Hydration of ions in solution is associated with
A. Liberation of heat
B. Absorption of heat
C. Reduction of heat
D. Conduction of heat

0. A piece of radioactive element has initially 8.0×10^{22} atoms. Half life is two days. After 16 days, the number of atoms is
A. 5×10^{21} B. 5×10^{22}
C. 2×10^{22} D. 2×10^{21}

1. Which of the following pairs of substances are hygroscopic?
A. CaCl and NaOH
B. CaO and KOH
C. Conc. H_2SO_4 and $MgCl_2$
D. CuO and CaO

2. Zinc is not regarded as a transition metal even though it is a d-block element because
A. It has no electron in 3d-orbitals
B. It has all 3d-orbitals completely filled
C. It blends with other neighbouring elements
D. It does not form complex ions like others

13. Silver chloride turns grey when exposed to sunlight because
A. The silver ion is reduced to silver
B. The silver ion is oxidized to silver
C. Silver is a transition metal
D. The silver chloride forms complexes in the sun

14. Which of these compounds exhibits resonance?
A. Benzene B. Ethanol
C. Propene D. Butyne

15. Hydrolysis of $CH_3COOCH_2CH_3$ in dilute HCl produces
A. $CH_3COOH + CH_3CH_3$
B. $CH_3CH_2OH + CH_3COCl$
C. $CH_3COOH + CH_3CH_2OH$
D. $CH_3COOH + CH_3CH_3$

SUCCESS QUOTE

Keep away from people who try to belittle your ambitions. Small people always do that, but those who are really great make you feel that you too can become great."

~ Mark Twain

CHEMISTRY 2008/2009 ANSWERS

1. $C_xH_y + (x+\frac{y}{4})O_2 \rightarrow xCO_2 + \frac{y}{2}H_2O$
$CH_4 + (1+\frac{4}{4})O_2 \rightarrow CO_2 + \frac{4}{2}H_2O$
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
Therefore, p = 1, q = 2, r = 1, s = 2
Ans. A

2. $2KHCO_3 \rightarrow K_2CO_3 + CO_2 + H_2O$
2moles of $KHCO_3$ = 1mole of CO_2
2[39+1+12+(16×3)]g of $KHCO_3$ = 1mole of CO_2
200g of $KHCO_3$ = 1mole of CO_2
But 1mole of CO_2 occupies $22.4dm^3$ at s.t.p.
→ 200g of $KHCO_3$ = $22.4dm^3$ of CO_2
OR
$22.4dm^3$ of CO_2 = 200g of $KHCO_3$
$0.224dm^3$ of CO_2 = $\frac{200 \times 0.224}{22.4}$g of $KHCO_3$
$0.224dm^3$ of CO_2 = 2g of $KHCO_3$
% of K_2CO_3 impurity = $\frac{2.5 - 2}{2.5} \times 100\%$
= 20%
Ans. D

3. The law of partial pressure states that if there is a mixture of gases which do not react chemically together, then the total pressure exerted by the mixture is the sum of the partial pressures of the individual gases that make up the mixture.
Mathematically, this can be expressed as:
$$P_T = P_A + P_B + P_C + \ldots.$$
Where P_T = total pressure of the mixture, and P_A, P_B, P_C, are the partial pressures exerted separately by the individual gases A, B, C that make up the mixture.
Let P_A, P_B, be the partial pressures exerted separately by CO_2 and N_2; and P_T the total pressure of the mixture.
No of moles of CO_2 (n_A) = 1.2moles
No of moles of N_2 (n_B) = 0.3 mole
Total No of moles(n_T) = 1.2+0.3
= 1.5moles

$$P_A = \left(\frac{n_A}{n_T}\right)P_T$$
$$2 = \left(\frac{1.2}{1.5}\right)P_T = 0.8P_T$$
$$P_T = \frac{2}{0.8} = 2.5 \text{ atm}$$
Therefore, $P_B = \left(\frac{n_B}{n_T}\right)P_T$
$$= \left(\frac{0.3}{1.5}\right) \times 2.5$$
= 0.5 atm
Ans. B

4. **Ans. A**

5. PH = 12, [OH] = ?
PH + POH = 14
12 + POH = 14
POH = 14 -12 = 2
POH = 2
But $POH = -\log_{10}[OH^-]$
Applying the law of indices, we have
$10^{POH} = 1/[OH^-]$
$\rightarrow 10^{-POH} = [OH^-]$
$[OH^-] = 10^{-2} = 0.01 mol/dm^3$
Ans. A

6. $NaHCO_3$ is an acidic salt. An acidic salt has an ionizable hydrogen and has all the properties of an acid.
Ans. A

7. Reducing agent (hydrogen peroxide) reduced the ion Pb^{4+} in PbO_2 to Pb^{2+} in $Pb(NO_3)_2$. **Ans. A**

8. Water that contains calcium and magnesium ions is called hard water. When these ions are accompanied by hydrogen carbonate ions, the water is

said to contain temporary hardness. It is called temporary because the calcium and magnesium ions can be removed from the water by boiling.
Temporary hardness can also be removed by using slaked lime, $Ca(OH)_2$ or by the use of washing soda, Na_2CO_3.

Ans. D

9. The hydration energy is the heat change that takes place when one mole of a gaseous ion dissolves in water to give an infinitely dilute solution. Hydration of ions in solution is associated with the liberation of a large amount of heat.

Ans. A

10. $N_0 = 8.0\times10^{22}$
$T_{½} = 2\text{days}, t = 16\text{days}, N = ?$
$\frac{N}{N_0} = \left(\frac{1}{2}\right)^{\frac{t}{T_{½}}}$
$\frac{N}{8.0 \times 10^{22}} = \left(\frac{1}{2}\right)^{\frac{16}{2}}$
$N = (½)^8 \times 8.0\times10^{22}$
$N = 3.125\times10^{20}$ atoms

11. Hygroscopic substances are those substances which when exposed to the atmosphere absorb moisture but will not turn into solution.
Concentrated sulphuric acid, potassium hydroxide, sodium hydroxide, zinc chloride and calcium chloride (and many different salts) are rather deliquescent, that is, they absorb moisture and turn into solution.

Ans. D

12. The atomic number of zinc is 30. Its electronic configuration is
$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}$
It has a completely filled 3d orbitals.

Ans. B

13. Ultraviolet radiation decomposes the silver halide, producing minute grains of metallic silver. The reality is almost certainly more complicated than this and involves the formation of complexes using the halide ions and the grains of silver and silver halide. The white silver chloride precipitate takes on a purplish colour when first exposed to light. This darkens and becomes more grey in colour.

Ans. D

14. One of the postulates of resonance theory is that when a molecule or ion can be represented by two or more contributing structures, then it is not adequately represented by any single contributing structure. We can represent benzene as a hybrid of two equivalent contributing structures, often referred to as Kekulé structures. Each Kekulé structure makes an equal contribution to the hybrid, and thus the C-C bonds are neither single nor double bonds but something intermediate. **Ans. A**

15. Ethyl ethanoate can be hydrolyzed by water into its component acid and alkanol again. In practice, this reaction is extremely slow, even on boiling, but it is catalyzed by hydrogen or hydroxide ions i.e. a dilute acid or alkali. **Ans. C**

SUMMARY OF ANSWERS
[CHEMISTRY 2008/2009]

1.A	2.D	3.B	4.A	5.A
6.A	7.A	8.D	9.A	10..
11.D	12.B	13.D	14.A	15.C

SUCCESS QUOTE

"Self-discipline is the bridge between goals and accomplishments."
~ Jim Rohn

CHEMISTRY 2009/10 QUESTIONS

1. The presence of NaCl in ice will
   A. lower the boiling point of NaCl
   B. increase the melting point of NaCl
   C. make NaCl impure
   d. lower the melting point of ice

2. What are the values of x, y and z in the equation below?
   $xNH_3 + yO_2 \rightarrow zNO + 6H_2O$
   A. 2, 3, 4 B. 4, 5, 4
   C. 6, 5, 4 D. 2, 3, 4

3. Calculate the volume of CO_2 measured at s.t.p produced on heating 250g of potassium hydrogen trioxocarbonate(IV) strongly. (K = 39, H = 1, C = 12, O = 16)
   A. 28 dm^3 B. 2.8 dm^3
   C. 5.6 dm^3 D. 11.2 dm^3

4. The boiling points of water, ethanol, methylbenzene and butan-2-ol are 373.0K, 351.3K, 383.6K and 372.5K respectively. Which liquid has the highest vapour pressure at 323.0K?
   A. Water B. Methylbenzene
   C. Ethanol D. Butan-2-ol

5. The conclusion from Rutherford's alpha-scattering experiment is that
   A. Atoms are mostly empty space with a small nucleus
   B. Emissions from radioactive substances consist of three main components
   C. There is a nuclear pull on orbital electrons
   D. Electrons are deflected by both magnetic and electric fields

6. Elements P, Q and R have atomic numbers 9, 16 and 20 respectively. Which of them would gain electron(s) during ionic bonding?
   A. Q and R B. P and R
   C. P and Q D. P, Q and R

7. Which of the following has the lowest pH?
   A. 5cm^3 of M/10 HCl
   B. 10cm^3 of M/10 HCl
   C. 20cm^3 of M/8 HCl
   D. 15cm^3 of M/2 HCl

8. Which of the following is an acid salt?
   A. $(NH_4)_2CO_3$ B. CHCOONa
   C. $KHSO_4$ D. $MgSO_4.7H_2O$

9. $CrO^{2-}_7 + 14H^+ + 6I \rightarrow 2Cr^{3+} + 3I_2 + 7H_2O$
   The change in the oxidation number of oxygen in the equation above is
   A. 0 B. 1
   C. 2 D. 7

10. During the electrolysis of $CuSO_4$ solution using Platinum electrodes, which of the following occurs?
    A. Acidity increases at the cathode
    B. Oxygen is liberated at the cathode
    C. pH decreases at the cathode
    D. pH of solution decreases

11. Which of the following ions is a pollution in drinking water even in trace quantities?
    A. Ca^{2+} B. Pb^{2+}
    C. Mg^{2+} D. Fe^{2+}

12. The solubility of a salt of molar mass 100g at 20°C is 0.34mol/dm^3. If 3.4g of that salt dissolved completely in 250cm^3 of water at that temperature, the resulting solution is
    A. A suspension
    B. Saturated
    C. Unsaturated
    D. Supersaturated

13. Catalyst is important in chemical industry in that
    A. It affects the purity of the products
    B. It affects the quantity of the products
    C. It increases the time for reaching equilibrium
    D. Bond breaking is slowed down

14. An alkanoic acid has a molecular mass of 88. Name the acid. (C = 12, O = 16, H = 1)
    A. Propanoic acid
    B. Botanic acid
    C. Pentatonic acid
    D. But-2-ionic acid

15. Ethyne undergoes the following reactions except
    A. Polymerization
    B. Addition
    C. Substitution
    D. Etherification

BONUS TIP

During study times, make study your only focus.

You will need to sacrifice every other thing including 2go, bbm, whatsapp, facebook, video games and TV for the sake of study. When you only have one focus for your mind, your mind will specialize to help you study effectively. I know that it might be difficult to let go of certain things due to them being habits, but you must realize that studying effectively is critical to success in UTME and post-UTME.

CHEMISTRY 2009/2010 ANSWERS

1. The melting point of a pure substance is always higher and has a smaller range than the melting point of an impure substance. The more the impurity present, lower the melting point and the broader the range. The presence of NaCl in ice will lower the melting point of ice.

   Ans. D

2. $4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$

   Ans. B

3. $2KHCO_3 \rightarrow K_2CO_3 + CO_2 + H_2O$

   2moles of $KHCO_3$ = 1mole of CO_2

   2[39+1+12+(16×3)]g of $KHCO_3$=1mole of CO_2

   200g of $KHCO_3$ = 1mole of CO_2

   But 1mole of CO_2 occupies 22.4dm^3 at s.t.p.

   → 200g of $KHCO_3$ = 22.4dm^3 of CO_2

   250g of $KHCO_3$ = $\frac{250 \times 22.4}{200}$

   = 28dm^3 of CO_2

   Ans. A

4. There is an inverse relationship between boiling point and vapour pressure. Thus, the high vapour pressure liquid will require a lower boiling point because its molecules already have high kinetic energy. If the vapour pressure gets lower, then it requires more energy to get these lethargic molecules into the atmosphere. So if you want to boil them away, the boiling point is usually higher. There is more inertia (ability to resist change) in a liquid with lower vapour pressure. **Ans. C**

5. **Ans. A**

6. $_9P = 1s^2\ 2s^2\ 2p^5$
$_{16}Q = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
$_{20}R = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$
P belongs to period 2 and group 7 of the periodic table (non-metal). Q belongs to period 3 and group 6 of the periodic table (non-metal). R belongs to period 4 and group 2 of the periodic table (metal). Non-metals gain electron(s) during ionic bonding while metals donate their electron(s). Therefore, P and Q would gain electron(s). **Ans. C**

7. $n = CV$, $pH = -\log_{10}[H^+]$
For A,
$n = \frac{5\ dm^3}{1000} \times \frac{1\ mole}{10\ dm^3} = 5 \times 10^{-4}$ moles
$pH = -[\log_{10}5 \times \log_{10}10^{-4}] = 3.3$

For B,
$n = \frac{10\ dm^3}{1000} \times \frac{1\ mole}{10\ dm^3} = 1 \times 10^{-3}$ moles
$pH = -[\log_{10}1 \times \log_{10}10^{-3}] = -[0 + (-3)] = 3$

For C,
$n = \frac{20\ dm^3}{1000} \times \frac{1\ mole}{8\ dm^3} = 2.5 \times 10^{-3}$ moles
$pH = -[\log_{10}2.5 \times \log_{10}10^{-3}] = 2.6$

For D,
$n = \frac{15\ dm^3}{1000} \times \frac{1\ mole}{2\ dm^3} = 7.5 \times 10^{-3}$ moles
$pH = -[\log_{10}7.5 \times \log_{10}10^{-3}] = 2.1$

From the above, we see that D has the lowest pH. **Ans. D**

8. An acid salt contains ionizable hydrogen. It has all the properties of an acid. It neutralizes alkali to form salt and water.
$KHSO_4 + KOH \rightarrow K_2SO_4 + H_2O$
Ans. C

9. We calculate the oxidation number of oxygen on the left hand side (LHS)
$Cr_2O_7^{2-} \rightarrow 2Cr + 7O = -2$
$2(+6) + 7O = -2$
$+12 + 7O = -2$
$7O = -2 - 12 = -14$
$O = -14/7 = -2$
Next, we calculate the oxidation number of oxygen on the right hand side (RHS)
$H_2O \rightarrow 2H + O = 0$
$2(+1) + O = 0$
$+2 + O = 0$
$O = -2$
Since LHS = RHS, change in oxidation number of oxygen in the equation is zero. **Ans. A**

10. The electrolysis of aq. $CuSO_4$ using platinum electrodes, yields copper deposits at the cathode and oxygen at the anode.
The solution becomes acidic as a result of the gradual discharge of Cu^{2+} and OH^-, leaving H^+ and SO_4^{2-} in the solution. **Ans. D**

11. No matter how small lead is present in water, it causes lead poisoning.
Ans. B

12. Molar mass of salt = 100g/mol = MM
Solubility in g/dm³ = Solubility in mol/dm³ x MM
Mass of the salt $= 0.3\frac{mol}{dm^3} \times 100\frac{g}{mol}$
$= 30g/dm^3$
30g of the salt saturates $1000cm^3$
What mass will saturate $250cm^3$?
That is, $\frac{30g \times 250cm^3}{1000cm^3} = 7.5g$ of salt
7.5g of the salt suppose to saturate $250cm^3$ of solution but 3.4g of salt were dissolved in it. Therefore, the

solution is unsaturated.

Ans. C

13. **Ans. C**

14. $C_nH_{2n+1}COOH = 88$

$(12\times n) + [1\times(2n+1)] + 12 + 16 + 16 + 1 = 88$

$12n + 2n + 1 + 45 = 88$

$14n + 46 = 88$

$14n = 88 - 46 = 42$

$n = \frac{42}{14} = 3$

$C_3H_{(2\times3)+1}COOH = C_3H_7COOH$

Therefore, the name of the acid is propanoic acid. **Ans. A**

Compare with Question No 4 of Year 2005/06.

15. **Ans. D**

SUMMARY OF ANSWERS
[CHEMISTRY 2009/10]

1.D	2.B	3.A	4.C	5.A
6.C	7.D	8.C	9.A	10.D
11.B	12.C	13.C	14.A	15.D

SUCCESS QUOTE

"Perseverance is the hard work you do after you get tired of doing the hard work you already did."

~ Newt Gingrich

CHEMISTRY 2010/2011 QUESTIONS
[Day 1]

1. Crystallization is better method of separation than precipitation because
   A. precipitation tends to bring other solutes out of solution
   B. crystallization is applicable to all solids
   C. precipitation always involves salting-out
   D. crystallization can only be done at high temperatures

2. Which of the following is not a chemical change?
   A. burning of magnesium
   B. rusting of iron
   C. action of water on potassium
   D. dissolving powdered sulfur in carbon disulfide

3. An important ore of iron contains 72.36% iron and 27.64% oxygen. Determine its empirical formula
   A. FeO B. Fe_2O_3
   C. Fe_3O_4 D. Fe_2O_2

4. Which of the following decreases when a given mass of gas is compressed to half its initial volume?
   A. average intermolecular distance
   B. frequency of collision
   C. number of molecules present
   D. atomic radius of each particle

5. The densities of two gases X and Y are $2.5gdm^{-3}$ and $10.0gdm^{-3}$ respectively. What is the rate of diffusion of X relative to Y?
   A. 1:2.5 B. 2.5:1
   C. 1:2 D. 2:1

6. The properties of elements are periodic

functions of their

A. atomic number
B. atomic radius
C. atomic volume
D. mass number

7. Which of the following solutions containing only hydroxyl ions will liberate hydrogen gas when reacted with Mg metals?
   A. $1.0\times10^{-5}moldm^{-3}$
   B. $1.0\times10^{-13}moldm^{-3}$
   C. $1.0\times10^{-3}moldm^{-3}$
   D. $1.0\times10^{-2}moldm^{-3}$

8. In the redox reaction
   $2Fe^{2+} + Cl_2 \rightarrow 2Fe^{3+} + 2Cl^-$
   A. Cl_2 is reduced because it has lost electrons
   B. Cl_2 is reduced because its oxidation number has decreased
   C. Fe^{2+} is reduced because it has lost electrons
   D. Fe^{2+} is reduced because it has gained electrons

9. During electrolysis of molten sodium chloride,
   A. chlorine atom gains an electron
   B. chloride ion gains an electron
   C. chloride ion is oxidized
   D. sodium ion is oxidized

10. Coffee stains are removed with
    A. turpentine
    B. ammonia
    C. borax in water
    D. kerosene

11. What is the value of ΔH for this reaction?
    $Fe_2O_{3(s)} + 3H_2O_{(l)} \rightarrow 2Fe(OH)_{3(s)}$

Substance	ΔH_f (KJ/mol)
$Fe_2O_{3(s)}$	- 824.2
$Fe(OH)_{3(s)}$	- 823.0
$H_2O_{(l)}$	- 285.8

A. 35.6 KJ
B. 286.0 KJ
C. 858.6 KJ
D. -536 KJ

12. $N_2O_{4(g)} \leftrightarrow 2NO_{2(g)}$ ΔH = +ve
    What happens to the equilibrium constant of the reaction above if the pressure is increased?
    A. it becomes zero
    B. it decreases
    C. it increases
    D. it is unaffected

13. Radioisotopes are used for the following EXCEPT
    A. development of photographic films
    B. generation of electricity
    C. radio carbon dating
    D. tracers in chemical reactions

14. The common characteristics shared by iron and aluminium is that both
    A. are extracted by reduction method
    B. form only basic oxides
    C. show oxidation states of +2 and +3
    D. form soluble hydroxides

15. In the reaction
    $H_3C\text{-}C\equiv CH + 2HBr \rightarrow X$
    X is
    A. $CH_3CBr_2CH_3$
    B. $CH_3CH_2CHBr_2$
    C. $CH_3CHBrCHBr$
    D. $CH_2BrCH_2CH_2Br$

SUCCESS QUOTE

"Whenever you get tired, learn to persevere."
~ Henry Divine

CHEMISTRY 2010/11 ANSWERS
[day 1]

1. Crystallization is used in industries where purity of products is important as in the manufacture of drugs and sugar production. This is not so with precipitation which tends to bring other solutes out of solution.

Ans. A

2. A chemical change is one which is not easily reversed and in which new substances are formed.

Ans. D

3.

Iron, Fe	Oxygen, O
72.36%	27.64%
$\frac{72.36}{56}$	$\frac{27.64}{16}$
1.2929	1.7275
$\frac{1.2929}{1.2929}$	$\frac{1.7275}{1.2929}$
1	$1.34 \approx 1$

Therefore, the empirical formula is FeO.

Ans. A

Compare with year 2006/07, Question no 2.

. Decrease in volume decreases the space which the gas molecules travel (that is, intermolecular distance). This in turn increases the rate or frequency of collision.

Ans. A

. $D_x = 2.5g/dm^3$, $D_y = 10g/dm^3$

$$\frac{R_X}{R_Y} = \sqrt{\frac{D_Y}{D_X}} = \sqrt{\frac{10}{2.5}}$$

$$\frac{R_X}{R_Y} = \frac{2}{1}$$

Therefore, $R_x:R_y = 2:1$

Ans. D

6. The modern periodic law states that the properties of the elements are a periodic function of their atomic numbers.

Ans. A

7. $H^+ \times OH^- = 10^{-14}$

But when $OH^- = 1\times10^{-13} mol/dm^3$,

$H^+ = \frac{10^{-14}}{1\times10^{-13}} = \frac{1}{1}(10^{-14-(-13)})$

$pH = -[\log_{10}1 \times \log_{10}10^{-1}] = 1$

Therefore **Ans. B**

8. Considering REDOX in terms of oxidation state, oxidation is the increase in oxidation number while reduction is the decrease in oxidation number from left to right of an equation.

Ans. B

9. During the electrolysis of molten sodium chloride, chlorine is discharged (at the anode) as follows:

$$Cl^-_{(aq)} \longrightarrow Cl + e^-$$

$$Cl + Cl \longrightarrow Cl_{2(g)}$$

Notice that Cl^- is oxidized to Cl by the loss of e^-.

Ans. C

10. **Ans. C**

11. ΔH = Heat contents of products - Heat contents of reactants

= 2(-823) - [-824.2 + 3(-285.8)]

= -1646 - (-824.2 - 857.4)

= -1646 - (-1681.6)

= -1646 + 1681.6

= 35.6KJ

Ans. A

12. Temperature change is the only factor that affects equilibrium constant. This is because equilibrium constant is affected by enthalpy and it is only temperature change that can effect

enthalpy change. This means that concentration change, change in pressure, and even application of catalyst, have no effect on the equilibrium constant of a reversible reaction. **Ans. D**

13. **Ans. A**

14. Note that option B is not correct because aluminium oxide reacts readily with dilute acids and strong alkalis to form salts, i.e. it is amphoteric.
Ans. D

15. The given reaction is an addition reaction. Going by the regioselectivity predicted by Markovnikov's rule, the H will add to the C with the most H already present. **Ans. A**
For more on Markovnikov's rule, go to Chemistry 101 (Quick Revision Aid), No 54.

SUMMARY OF ANSWERS
[CHEMISTRY 2010/2011 day 1]

1.A	2.D	3.A	4.A	5.D
6.A	7.B	8.B	9.C	10.C
11.A	12.D	13.A	14.D	15.A

SUCCESS QUOTE

"Failure will never overtake you if your determination to succeed is strong enough."
~ Og Mandino

CHEMISTRY 2010/11 QUESTIONS
[Day 2]

1. The separation of oil and water with different boiling points can best be achieved by
   A. fractional distillation
   B. decantation
   C. evaporation
   D. using a separating funnel

2. Calculate the minimum volume of oxygen that is required for the complete combustion of a mixture of $20cm^3$ of CO and $25cm^3$ of hydrogen
   A. $45cm^3$ B. $22.5cm^3$
   C. $20cm^3$ D. $10cm^3$

3. An increase in temperature causes an increase in the pressure of a gas because there is an increase in the
   A. average velocity of the gas molecules
   B. number of collisions between the gas molecules
   C. density of the gas molecules
   D. free mean path between each molecule and the other

4. A liquid begins to boil when
   A. its vapour pressure is equal to the vapour pressure of its solid at a given temperature
   B. molecules start escaping from the surface
   C. its vapour pressure equals the atmospheric pressure
   D. its volume is slightly increased

5. If the relative rate of diffusion of a gas is 0.25 and that of Cl_2 under the same conditions is 0.20, calculate the relative molecular mass of the gas.
   A. 22.7 B. 45.4
   C. 68.1 D. 90.8

5. The following molecules contain hydrogen bonding EXCEPT
   A. ammonia
   B. ethanoic acid
   C. hydrogen fluoride
   D. water

7. If 20 cm^3 of distilled water is added to 80cm^3 of 0.50 mol/dm^3 HCl solution, the new concentration of the acid is
   A. 0.10 mol/dm^3 B. 0.20 mol/dm^3
   C. 0.40 mol/dm^3 D. 2.00 mol/dm^3

8. What is H_2O_2 acting as in the in the equation below?
   $H_2O_2 + 2H^+ + 2Fe^{2+} \rightarrow 2H_2O + 2Fe^{3+}$
   A. oxidizing agent
   B. reducing agent
   C. an acid
   D. a base

9. A current was passed for 10mins 20secs and 0.1 mole of Cu was deposited. How many grams of silver will be deposited by the same quantity of electricity [Ag = 108]
   A. 10.8 g B. 21.6 g
   C. 5.4 g D. 108 g

10. Which of the following statements is correct?
   A. dissolution of anhydrous $CuSO_4$ is exothermic while that of hydrated $CuSO_4$ is endothermic
   B. dissolution of anhydrous $CuSO_4$ is endothermic while that of hydrated $CuSO_4$ is exothermic
   C. dissolution of both anhydrous $CuSO_4$ and hydrated $CuSO_4$ is exothermic
   D. dissolution of both anhydrous $CuSO_4$ and hydrated $CuSO_4$ is endothermic

11. $NO_{(g)} + CO_{(g)} \rightleftharpoons \frac{1}{2}N_{2(g)} + CO_{2(g)}$ $\Delta H = -89.3KJ$
   What conditions would favour maximum conversion of nitrogen(II) oxide and carbon(II) oxide in the reaction above?
   A. low temperature and high pressure
   B. high temperature and low pressure
   C. high temperature and high pressure
   D. low temperature and low pressure

12. Which of the alloys below does not contain copper?
   A. brass B. bronze
   C. type metal D. solder

13. $2Al_{(s)} + 2NaOH_{(aq)} + 6H_2O_{(l)} \longrightarrow 2NaAl(OH)_{4(aq)} + 3H_{2(g)}$
   From the equation, give the condition of reaction
   A. cold dil. NaOH
   B. hot concentrated NaOH
   C. warm dilute NaOH
   D. hot dilute NaOH

14. Ethanol reacts with aqueous sodium oxoiodate(I) to give a bright yellow solid with a characteristic smell. The product is
   A. trichloromethane
   B. ethanal
   C. iodoethane
   D. triiodomethane

15. An alkanoic acid has a molar mass of 102 g. Derive its molecular formula and hence name the acid
   A. propanoic acid
   B. butanoic acid
   C. pentanoic acid
   D. hexanoic acid

SUCCESS QUOTE

"If you can imagine it, you can achieve it. If you can dream it, you can become it."
~ *William Arthur Ward*

salts (in this case, $CuSO_4.5H_2O$) is endothermic. **Ans. A**

11. Since the reaction is exothermic and the reactants are in the gaseous state, the forward reaction would be favoured by low temperature and high pressure. **Ans. A**

12. Soft solder is an alloy of lead (Pb) and tin (Sn). It does not contain copper. **Ans. D**

13. Aluminium is readily dissolved in dilute aqueous sodium hydroxide to yield sodium aluminate and hydrogen. The reaction occurs even at room temperature. **Ans. A**

14. **Ans. B** (For detailed explanation, go to 2012/13, No 14.)

15. The general molecular formular of alkanoic acid is $C_nH_{2n+1}COOH$.
$C_nH_{2n+1}COOH = 102$
$12n + 1(2n+1) + 12 + 16 + 16 + 1 = 102$
$12n + 2n + 1 + 45 = 14n + 46 = 102$
$14n = 102 - 46 = 56$
$n = 56/14 = 4$
$C_4H_{(2\times4+1)}COOH \rightarrow C_4H_9COOH$
The name of the acid is butanoic acid. **Ans. B**

SUMMARY OF ANSWERS
[CHEMISTRY 2010/2011 (day 2)]

1.A	2.B	3.B	4.C	5.D
6...	7.D	8.A	9.B	10.A
11.A	12.D	13.A	14.B	15.B

SUCCESS QUOTE

"Never regret your past. Rather, embrace it as the teacher that it is."
~ *Robin S. Sharma*

CHEMISTRY 2011/2012 QUESTIONS

1. Addition of water to calcium oxide leads to:
A. a physical change
B. a chemical change
C. the formation of a mixture
D. an endothermic reaction

2. 15 g of impure Na_2CO_3 reacted with excess HNO_3. If 0.1 mole of CO_2 is produced, what is the percentage purity of the Na_2CO_3? [Na = 23, C = 12, O = 16]
A. 35.3% B. 10.0%
C. 70.66% D. 90.0%

3. 0.14 g of a hydride of carbon occupies 112.0 cm^3 at STP when evaporated. The ratio of carbon to hydrogen is 1:2. The relative molecular formular is
A. C_2H_4 B. C_3H_6
C. C_4H_8 D. C_6H_{12}

4. A gas X diffuses twice as fast as a gas Y under the same conditions. If the relative molecular mass of Y is 112, calculate the relative molecular mass of X.
A. 28 B. 14
C. 56 D. 120

5. In the periodic table, what is the property that decreases along the period and increases down the group?
A. Atomic number
B. Electron affinity
C. Ionization potential
D. Ionic radius

6. 10 cm^3 of 0.1 M HCl are added to 10 cm^3 of NaOH solution containing 8 g of NaOH per dm^3 of solution. What is the pH of the resulting solution?
A. 11 B. 13
C. 7 D. 8

CHEMISTRY 2010/11 ANSWERS
[day 2]

1. Separation of liquid mixture using their different boiling points is called fractional distillation. **Ans. A**

2. $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$
   2 : 1 : 2
   20 : 10 : 20
   For CO, $10cm^3$ of O_2 is needed
   $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$
   2 : 1 : 2
   25 : 12.5 : 25
   For H_2, $12.5cm^3$ of O_2 is needed
   Minimum O_2 needed for CO and H_2 = 10+12.5
   $= 22.5cm^3$
   Ans. B

3. Increase in temperature increases the kinetic energy of the gas molecules, which in turn increases the rate of collision of the gas molecules. **Ans. B**

4. Boiling, by definition, is the temperature at which the saturated vapour pressure is equal to external pressure (atmospheric pressure). **Ans. C**

5. Let the gas be G; let Chlorine be Cl.
   $R_G = 0.25$, $R_{Cl} = 0.20$, $M_{Cl} = 71$, $M_G = ?$
   $$\frac{R_G}{R_{Cl}} = \frac{\sqrt{M_{Cl}}}{\sqrt{M_G}} \rightarrow \frac{0.25}{0.20} = \frac{\sqrt{71}}{\sqrt{M_G}}$$
   $$\sqrt{M_G} = \frac{0.20 \times \sqrt{71}}{0.25} = 6.74$$
   $M_G = 6.74^2 = 45.44$
   RMM of G = 45.44 x 2 = 90.88
   Ans. D

6. Hydrogen bonds occur between molecules that have a permanent net dipole resulting from hydrogen being covalently bonded to either fluorine, oxygen or nitrogen. For example, hydrogen bonds operate between molecules of water (H_2O), ammonia (NH_3), hydrogen fluoride (HF), and hydrogen peroxide (H_2O_2). Hydrogen bonds also occur in organic molecules such as alkanols, alkanoic acids and amines.

7. $C_1V_1 = C_2V_2$ (dilution equation)
   $C_1 = 0.50mol/dm^3$, $C_2 = ?$,
   $V_1 = 80cm^3$, $V_2 = 20cm^3$
   $$C_2 = \frac{C_1V_1}{V_2} = \frac{0.50mol/dm^3 \times 80cm^3}{20cm^3}$$
   $C_2 = 2.0mol/dm^3$
   Ans. D

8. H_2O_2 acted as oxidizing agent. **Ans. A**

9. Mass of Cu = 0.1mol x 63.5g/mol
   = 6.35g of Cu
   $Cu^{2+} + 2e^- \rightarrow Cu$
   $Ag^+ + e^- \rightarrow Ag$
   $$\frac{Xg}{108} \times 1F = \frac{6.35g}{63.5} \times 2F$$
   $$\rightarrow Xg \text{ of Ag} = \frac{108 \times 6.35g \times 2F}{63.5 \times 1F}$$
   = 21.6g
   Ans. B

10. Note that in an *exothermic reaction* energy is given out, usually in the form of heat. Whereas in an *endothermic reaction* energy is taken in, often as heat, from the surroundings.

    Dissolution of anhydrous copper sulphate is a very good example of exothermic reaction.

    $CuSO_4(s) + 5H_2O(l) \rightleftharpoons CuSO_4.5H_2O(s)$ ΔH= -ve
    Generally, the dissolution of hydrated

7. What is the formular of sodium gallate if gallium (Ga) shows an oxidation number of +3?
   A. $NaGaO_3$ B. $Na_2Ga(OH)_2$
   C. $NaGa(OH)_3$ D. $NaGa(OH)_4$

8. The mass of Ag deposited when a current of 10 A is passed through a solution of silver salt for 4830 secs is: [Ag = 108, 1F = 96500C]
   A. 54.0g B. 27.0g
   C. 13.5g D. 108.0g

9. The solubility of alkanols in water is due to
   A. their covalent nature
   B. hydrogen bond
   C. their low boiling point
   D. their ionic character

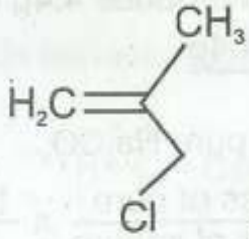
10. If a reaction is exothermic and there is a great disorder, it means
   A. the reaction is in a state of equilibrium
   B. there will be a large increase in free energy
   C. there will be a large decrease in free energy
   D. the reaction is static

11. In what way is the equilibrium constant for the forward reaction related to that of the reverse reaction?
   A. the two equilibrium constants are identical
   B. the product of the two is expected to be one
   C. the product of the two is always greater than one
   D. the addition of the two is expected to be one

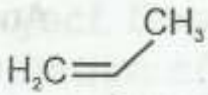
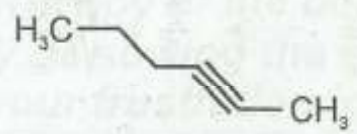
12. Natural radioactivity is the random spontaneous disintegration of the nucleus of heavy isotopes of certain elements with the emission of
   A. α, β and X-rays
   B. α, β and γ-rays
   C. α, X and γ-rays
   D. β, X and γ-rays

13. Mg ribbon was allowed to burn inside a given gas P leaving a white solid residue Q. Addition of water to Q liberated a gas which produces dense white fumes with a drop of hydrochloric acid. The gas P was
   A. Nitrogen B. Chlorine
   C. Oxygen D. Sulphur(IV) oxide

14. The IUPAC name for the compound



is
   A. 1-chloro-2-methylprop-2,3-ene
   B. 1-chloro-2-methylprop-2-ene
   C. 3-chloro-2-methylprop-1-ene
   D. 3-chloro-2-methylprop-1,2-ene

15. Which of the following behaves like ethyne?
   A.
   B.
   C. 
   D. 

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CHEMISTRY 2011/2012 ANSWERS

1. Calcium oxide (and oxides of potassium and sodium) react with water to form hydroxides. That's a chemical change.

$CaO_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)}$

Ans. B

2. $Na_2CO_3 + 2HNO_3 \longrightarrow 2NaNO_3 + CO_2 + H_2O$

From the equation above,

$Na_2CO_3 = (2 \times 23) + 12 + (16 \times 3) = 106g/mol$

$CO_2 = 12 + (16 \times 2) = 44g/mol$

Mass = mole x molar mass

Mass of CO_2 = 0.1mol x 44g/mol = 4.4g

106g of Na_2CO_3 produces 44g of CO_2

xg of Na_2CO_3 will produce 4.4g of CO_2

i.e. $x = \frac{106g \times 4.4\cancel{g}}{44\cancel{g}}$

= 10.6g of pure Na_2CO_3.

$\% \text{ Purity} = \frac{\text{mass of pure}}{\text{mass of impure}} \times \frac{100}{1}$

$\% \text{ Purity} = \frac{10.6g}{15g} \times \frac{100}{1} = 70.66\%$

Ans. C

3. 0.14g of $CH_2 \longrightarrow 112cm^3$ at s.t.p

xg of $CH_2 \longrightarrow 22400cm^3$ at s.t.p

i.e. $\frac{0.14g \times 22400\cancel{cm^3}}{112\cancel{cm^3}} = 28g$ of CH_2

Therefore, $(CH_2)_n = (12 + 2 \times 1)_n = 28$

14n = 28, n = 2.

$(CH_2)_2 = C_2H_4$

Molecular formular = C_2H_4

Ans. A

4. $R_x = 2, R_y = 1, M_y = 112, M_x = ?$

$\frac{R_x}{R_y} = \frac{\sqrt{M_y}}{\sqrt{M_x}} \longrightarrow \frac{2}{1} = \frac{\sqrt{112}}{\sqrt{M_x}}$

$2\sqrt{M_x} = \sqrt{112} \longrightarrow M_x = \left(\frac{\sqrt{112}}{2}\right)^2 = 28$

Ans. A

5. Down the groups, additional layers of electrons are being added causing the ionic radius to increase. Across the periods, the ionic radius decreases for metals forming cations, as the metals lose their outer electron orbitals. The ionic radius increases for non-metals as the effective nuclear charge decreases due to the number of electrons exceeding the number of protons. **Ans. D**

6. $HCl + NaOH \longrightarrow NaCl + H_2O$

n = CV

For HCl,

$\frac{0.1mol}{\cancel{dm^3}} \times \frac{10\cancel{dm^3}}{1000} = 0.001mole$

For NaOH,

$mol/dm^3 = \frac{g/dm^3}{MM}$

MM of NaOH = 23 + 16 + 1 = 40g/mol

$\therefore mol/dm^3 \text{ of NaOH} = \frac{8g/dm^3}{40g/mol}$

$= 0.2mol/dm^3$

but n = CV,

$\frac{0.2mol}{\cancel{dm^3}} \times \frac{10\cancel{dm^3}}{1000} = 0.002mole$ of NaOH

Therefore,

0.001mol of HCl + 0.002mol of NaOH

$\longrightarrow$ 0.001mol of NaOH + 1mol of NaCl+H_2O

This implies that the resulting solution is essentially basic.

0.001mole of NaOH = 1×10^{-3}mole of OH^-

PH + POH = 14, PH = 14 - POH

But POH = $-\log[OH^-] = -\log[1 \times 10^{-3}] = 3$

$\therefore$ PH = 14 - 3 = 11

Ans. A

7. Using the method below, test each of the formulas in the options to note the one in which gallium shows an oxidation number of +3.
Recall that the oxidation numbers of O, H and Na are -2, +1 and +1 respectively.
$NaGa(OH)_4 = 0$
$1 + Ga + (-2 \times 4) + (+1 \times 4) = 0$
$1 + Ga - 8 + 4 = 0$
$Ga + 1 - 4 = 0$
$Ga - 3 = 0$
$Ga = +3$ **Ans. D**

8. $Ag^+ + e^- \longrightarrow Ag$ *(where e = 1F = 96500C)*
$Q = It = 10 \times 4830 = 48300C$
108g of Ag is discharged by 96500C
xg of Ag will be discharged by 48300C
i.e. $\frac{108g \times 48300\not{C}}{96500\not{C}} = 54.05g$ of Ag

Ans. A

9. Alkanols are compounds that contain the O-H (functional) group of atoms attached to a hydrocarbon chain. The solubility of alkanols in water is due to the hydrogen bonds formed between water and the hydroxy group (O-H).

Ans. B

10. If a reaction is exothermic and results in a great disorder, the combined changes in the enthalpy and entropy will lead to a large decrease in free energy, making the reaction to be spontaneous.

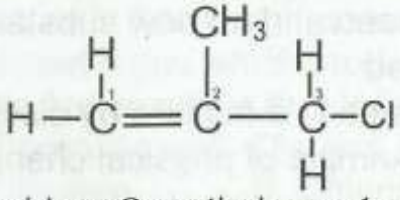
Ans. C

11. **Ans. B** For detailed explanation, go to Answer to Question no 9, of year 2005/2006)

12. **Ans. B**

13. $3Mg_{(s)} + N_{2(g)} \longrightarrow Mg_3N_{2(s)}$
$Mg_3N_{2(s)} + 6H_2O_{(l)} \longrightarrow 3Mg(OH)_{2(s)} + 2NH_{3(g)}$
$NH_3 + HCl \longrightarrow \underset{\text{white fume}}{NH_4Cl}$ **Ans. A**

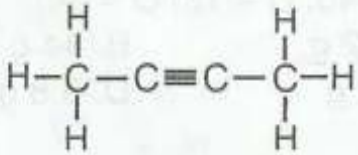
14. We redraw the compound for clarity.



3-chloro-2-methylprop-1-ene

Ans. C

15. This behaves like ethyne



Ans. B

SUMMARY OF ANSWERS
[CHEMISTRY 2011/2012]

1.B	2.C	3.A	4.A	5.D
6.A	7.D	8.A	9.B	10.C
11.B	12.B	13.A	14.C	15.B

DON'T FORGET

SURE SUCCESS is more than just a book. It's a Divine Project. Don't fall into the temptation of photocopying or preparing with a photocopy of the book. You may be sowing the seed for your frustration in life.

CHEMISTRY 2012/2013 QUESTIONS

1. Which of the following statements is **incorrect**?
   A. The addition of water to quicklime is an example of a physical change
   B. A chemical change is irreversible and a new substance is formed
   C. A physical change can easily be reversed and no new substances are formed
   D. Separating a mixture by distillation is an example of physical change

2. 20 g of calcium trioxocarbonate(IV) is heated to a constant mass and 11.2 g of calcium oxide is left as residue. The mass of the gaseous product left is [Ca = 40, C = 12, O = 16]
   A. 11.2 g B. 44 g
   C. 2.2 g D. 8.8 g

3. The vapour pressure of water at 15 °C is 13 mmHg. At a barometric pressure of 747 mmHg, 2 dm^3 of nitrogen gas is collected over water at 15 °C. The pressure of nitrogen gas is
   A. 760 mmHg B. 747 mmHg
   C. 734 mmHg D. 114.3 mmHg

4. Elements X, Y and Z belong to groups I, V and VI respectively. Which of the following is TRUE about the bond types of XZ and YZ_3?
   A. Both are electrovalent
   B. Both are covalent
   C. XZ is electrovalent and YZ_3 is covalent
   D. XZ is covalent and YZ_3 is electrovalent

5. Which of the following is a double salt?
   A. $Pb(OH)_2.2PbCO_3$
   B. $KAl(SO_4)_2.12H_2O$
   C. $K_3Fe(CN)_6$
   D. $KHSO_4$

6. Find the value of ***n*** in the equation
   $XO_3^{n-} + 4H^+ + 3e^- \longrightarrow XO + 2H_2O$
   A. 1 B. 2
   C. 3 D. 5

7. Corrosion in metals is an example of
   A. electrochemical process
   B. half-cell reaction
   C. metal-plating device
   D. metal coupling device

8. An example of a suspension of solid particles in a gas is
   A. Harmattan B. Aerosol spray
   C. Fogs D. Emulsion

9. In which of the following is the change in entropy positive?
   A. $2H_2O_{(g)} + SO_{2(g)} \longrightarrow 2H_2O_{(l)} + 3S_{(s)}$
   B. $H_2O_{(s)} \longrightarrow H_2O_{(l)}$
   C. $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$
   D. $Cu^{2+}_{(aq)} + Fe_{(s)} \longrightarrow Fe^{2+}_{(aq)} + Cu_{(s)}$

10. $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)}$ ΔH = -ve
    The formation of SO_3 in the equation above will be favoured by
    A. addition of SO_3
    B. high pressure
    C. high temperature and low pressure
    D. high temperature and addition of catalyst

11. When $^{238}_{92}U$ emits an x-ray and a β-ray, the product X has a mass number and an atomic number respectively

A. 234 and 90 B. 234 and 91
C. 230 and 88 D. 238 and 91

12. The producer gas is a miixture of
A. CO and CO_2 B. CO and N_2
C. CO and H_2 D. CO and CO_2

13. The IUPAC name of the compound below is
$H_3CCH(CH_3)CHCHCH_3$
A. Hex-2-ene
B. Hex-3-ene
C. 2-methylpent-4-ene
D. 4-methylpent-2-ene

14. Ethanol reacts with aqueous Sodium oxoiodate(I) to give a bright yellow solid with a characteristic smell. The product is
A. trichloromethane
B. triiodomethane
C. iodoethane
D. ethanal

15. Plastics which lose their plasticity on being subjected to heat are said to be
A. biodegradable B. polymeric
C. thermosets D. thermoplastics

SUCCESS QUOTE

"A man, as a general rule, owes very little to what he is born with - a man is what he makes of himself."
~ Alexander Graham Bell

CHEMISTRY 2012/2013 ANSWERS

1. Addition of water to quicklime is a chemical change.
$CaO + H_2O \longrightarrow Ca(OH)_2$
Ans. A

2. $CaCO_3 \longrightarrow CaO + CO_2$
$CaCO_3 = 40 + 12 + (16 \times 3) = 100g/mol$
$CO_2 = 12 + (16 \times 2) = 44g/mol$
100g of $CaCO_3$ = 44g of CO_2
20g of $CaCO_3$ = ?
i.e. $\frac{20 \times 44}{100}$ = 8.8g of CO_2
Ans. D

3. $P_{total} = P_{water} + P_{nitrogen}$
$747 = 13 + P_{nitrogen}$
$P_{nitrogen} = 747 - 13 = 734mmHg$
To calculate the partial pressure of a gas collected over water, simply subtract the partial pressure of water vapor from the total pressure at which the sample was collected.
Ans. C

4. **Ans. C**

5. Double salts are salts which ionize to produce three different types of ions in solution. Usually two of these are positively charged (metallic or ammonium ions), while the other is negatively charged.
$KAl(SO_4)_2.12H_2O \longrightarrow K^+, Al^{3+}, SO_4^{2-}$
Ans. B

6. $XO_3^{n-} + 4H^+ + 3e^- \longrightarrow XO + 2H_2O$
$-n + 4 - 3 = 0; -n + 1 = 0$
$-n = -1; n = 1$ **Ans. A**

The corrosion process is essentially an oxidation or anodic *half cell reaction* in which metal atoms are transformed to their ions, resulting in weight loss or thinning of the solid material. **Ans. B**

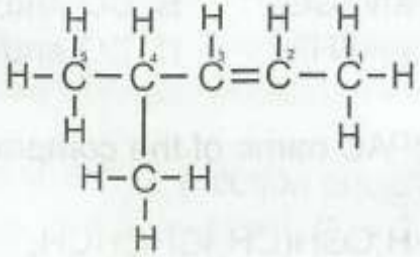
An aerosol is a suspension of fine solid particles or liquid droplets in a gas.
Ans. B

Entropy is the measure of the disorder of a system. A highly ordered system has low entropy. For example, a block of ice will increase in entropy as it melts.
To predict the sign of the entropy change of a reaction, we note that *entropy of a reaction* refers to the positional probabilities for each reactant. An atom in gas phase has more options for position than the same atom in a solid phase. This is why gases have more entropy than solids.'
In reactions, the positional probabilities must be compared for all the reactants to the products produced.
If the reaction involves only gases, the entropy is related to the total number of moles on either side of the reaction. A decrease in the number of moles on the product side means lower entropy. An increase in the number of moles on the product side means higher entropy.
If the reaction involves multiple phases, the production of a gas typically increases the entropy much more than any increase in moles of a liquid or solid. **Ans. B**

). $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ ΔH = -ve
Increase in the pressure of the above reaction will favour the forward reaction.
Ans. B

11. **Ans. D**

12. Coke + Air $\xrightarrow[\text{red hot}]{}$ $CO + N_2$
Ans. B

13. 
4-methylpent-2-ene
Ans. D

14. Aqueous sodium oxoiodate(I) is a strong oxidizing agent which oxidizes ethanol to ethanal in limited supply. Ethanal is a colourless liquid with a characteristic pungent, fruity smell. **Ans. D**

15. In polymer chemistry, the term *plastic* refers to any polymer that can be molded when hot and retains its shape when cooled.
Thermosets are polymers that can be molded when they are first prepared, but once cooled, harden irreversibly and cannot be successfully reheated/remelted or remolded. *Thermoplastics* soften when heated and harden/strengthen after cooling. They can be heated, shaped and cooled as often as necessary without causing a chemical change, while thermosets will burn when heated after the initial molding. **Ans. C**

SUMMARY OF ANSWERS
[CHEMISTRY 2012/2013]

1.A	2.D	3.C	4.C	5.B
6.A	7.B	8.B	9.B	10.B
11.D	12.B	13.D	14.D	15.C

CHEMISTRY 2012/13 QUESTIONS (DE)

1. 1 g of compound X (m.pt. 122 °C) is added to 100 g of another compound Y (m.pt. 95 °C). Which of the following is likely to be the melting point of the mixture?
   A. 95 °C
   B. 120 °C
   C. 96 °C
   D. 94 °C

2. The density of a certain gas is 1.98 gdm^{-3} at s.t.p. What is the molecular mass of the gas? [GMV = 22.4dm^3]
   A. 26.0 g
   B. 31.0 g
   C. 54.0 g
   D. 44.0 g

3. When a substance changes from liquid state to gaseous state, the attractive force between the molecules
   A. increases
   B. decreases
   C. remains the same
   D. fluctuates

4. A species *W* has 16 protons, 17 neutrons and 18 electrons. *W* must be
   A. a neutral atom of a metal
   B. a cation of two positive charges
   C. an anion of one negative charge
   D. an anion of two negative charges

5. A solution of NaOH containing 6.0 g in 250 cm^3 of solution has a concentration of
   A. 0.04 $moldm^{-3}$
   B. 0.15 $moldm^{-3}$
   C. 0.60 $moldm^{-3}$
   D. 0.96 $moldm^{-3}$

6. When CO_2 is passed through clear limewater it turns milky. Which of the following statements is correct of the limewater?
   A. The clear limewater is harder than the one turned milky by CO_2
   B. The clear limewater is softer than the one turned milky by CO_2
   C. CO_2 causes the hardness of the limewater
   D. The clear limewater is soft water

7. Heat content difference between the products and reactants of a chemical reaction is called
   A. activation energy
   B. endothermic reaction
   C. exothermic reaction
   D. enthalpy change

8. The concentration of iodine in the equilibrium mixture can be increased by
   $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)} \quad \Delta H = +10\ KJ$
   A. raising the pressure
   B. lowering the pressure
   C. raising the temperature
   D. lowering the temperature

9. Which of the following statements is CORRECT about the difference between nuclear reaction and chemical reaction?
   A. Heat energy is emitted in nuclear reaction but not in chemical reaction
   B. New substances are formed in nuclear reaction while in chemical reaction no new substances are formed
   C. Rays are emitted in nuclear reaction but not in chemical reaction
   D. Chemical reaction involves changes in orbital electrons while nuclear reaction affects only the nucleus

10. The alloy used for metal work and plumbing contains
    A. Aluminium and Copper
    B. Iron and Carbon
    C. Iron and Nickel
    D. Lead and Tin

1. Which of the following compounds will undergo thermal dissociation?
   A. AgCl B. $CaCO_3$
   C. K_2SO_4 D. NH_4Cl

2. $CH_3C(CH_3)_2CH_2CH(CH_3)_2$
   The IUPAC name of the compound above is
   A. 2,2,4-trimethylpentane
   B. 4,4,2-trimethypentane
   C. Octane
   D. 2,4-dimethylhexane

3. Which of the following pairs are isomers?
   A. 1-propanol and methoxyethane
   B. 1-propanol and propanal
   C. 2-propanol and propanone
   D. 2-propanol and propanal

4. When two drops of Million's reagent was added to a substance X in a test tube, a white ppt which turns brick-red on heating was formed. To which of the following does X belong?
   A. Carbohydrates B. Fats and oils
   C. Vitamins D. Proteins

5. Which of the following is not an addition polymer?
   A. Bakelite B. Neoprene
   C. PVC D. Perspex

BONUS TIP

The Quick Subject Revision Aids in this book are repositories of likely examination questions for UNN post UTME/DE screening. Be wise enough to go through them thoroughly.

CHEMISTRY 2012/2013 ANSWERS

(DE)

1. The mass of X is insignificant in the mixture and, therefore, will not affect the melting point of the mixture.
   Ans. A

2. Density = $\frac{\text{mass}}{\text{volume}}$
   1 mole of any gas at stp = $22.4dm^3$
   mass = $1.98g/dm^3 \times 22.4dm^3 = 44.352g$
   but $n = \frac{\text{mass}}{\text{molar mass}}$, where $n = 1$
   Therefore, molar mass = $\frac{44.35}{1} = 44.35g$
   Ans. D

3. When a substance changes from liquid state to a gaseous state the attractive force between the molecules decreases.
   Ans. B

4. Note that for a neutral atom, the number of protons equals the number of electrons. Anions accept electrons during chemical combination which gives them negative charges. **Ans. D**

5. 6.0g of NaOH $\longrightarrow$ $250cm^3$
   xg of NaOH $\longrightarrow$ $1000cm^3$
   i.e. $\frac{6.0g \times 1000cm^3}{250cm^3} = 24g/dm^3$
   molar mass of NaOH = 23+1+16 = $40g/dm^3$
   concentration of NaOH = $\frac{24g/dm^3}{40g/mol}$
   $= 0.60mol/dm^3$
   Ans. C

6. CO_2 precipitates the soluble $Ca(HCO_3)_2$ out of solution inform of insoluble $CaCO_3$. **Ans. C**

7. Enthalpy is the heat content of any reaction.
$\Delta H = H_p - H_r$
ΔH = change in enthalpy
H_p = heat content of product
H_r = heat content of reactant

Ans. D

8. $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$ $\Delta H = +10$ KJ
Though all the molecules are in the gaseous phase, a change in pressure will not affect the reaction because the total number of moles on the left hand side is equal to the total number of moles on the right hand side of the equation. Increase in temperature will increase the concentration of iodine because the forward reaction is endothermic.

Ans. C

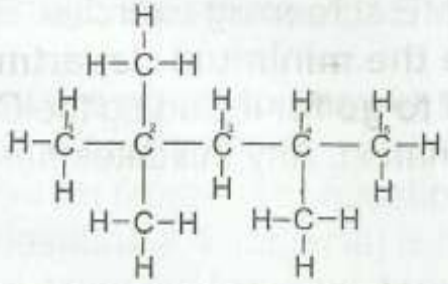
9. Rays (alpha, gamma and beta rays) are all emitted in nuclear reactions but not in chemical reaction. **Ans. C**

10. The alloy used for metal work and plumbing contains soft solder which is made up of 50-70% lead and 30-50% tin. **Ans. D**

11. $CaCO_3 \longrightarrow CaO + CO_2$

Ans. B

12.



2,2,4-trimethylpentane **Ans. A**

13. 1-propanol and methoxyethane are isomers with molecular formula C_3H_8O. Actually, they are a variety of isomers called *functional group isomers* i.e. they have the same molecular formula but different functional groups. **Ans. A**

14. When drops of Million's reagent are added to proteins, a white ppt (which turns brick-red on heating) is formed. This is one of the laboratory tests for proteins. **Ans. D**

15. An *addition polymer* is a polymer which is formed by an addition reaction, where many monomers bond together via rearrangement of bonds without the loss of any atom or molecule. This is in contrast to a *condensation polymer* which is formed by a condensation reaction where a molecule, usually water, is lost during the formation. Perspex, PVC and neoprene are addition polymers.

Ans. A

SUMMARY OF ANSWERS
[CHEMISTRY 2012/2013 (DE)]

1.A	2.D	3.B	4.D	5.C
6.C	7.D	8.C	9.C	10.D
11.B	12.A	13.A	14.D	15.A

SUCCESS QUOTE

It's never too late to start, but it's always too early to quit.
~ Norman Vincent Peale