UCE physics 2015 paper 1

Section A

Answer all questions in this section

1. Which one of the following liquids has abnormal expansion?
   A. Water B. paraffin C. mercury D. alcohol
   Answer is A
2. Pressure in solids depends on
   A. Density of the material
   B. Mass of the solid
   C. Volume occupied
   D. Area of contact
   Answer is A; pressure = $\frac{Force}{area}$; therefore depend on the area of contact.
3. In a cathode ray tube, the grid is the
   A. Electron producer
   B. Electron accelerator
   C. Brightness controller
   D. Beam deflector
   Answer is C; grid controls the number of electrons reaching the screen, thus, the brightness
4. Which one of the following is an application of microwaves?
   A. Cooking
   B. Production of photography
   C. Finding flaws in metals
   D. Sterilizing equipment
   Answer is A
5. The S.I unit of volume of liquids is
   A. Litres
   B. Decimetre cubed
   C. Meter cubed
   D. Millilitres
   Answer is C
6. The reluctance of a body to change its state of motion depends on its
   A. Acceleration
   B. Momentum
   C. Velocity
   D. Mass

Answer D

7. images formed by diverging mirrors are
   A. laterally inverted
   B. magnified
   C. virtual
   D. real
   Answer is C;
   All images formed by diverging mirror are virtual and diminished
8. Which one of the following produces e.m.f by heating
   A. Thermoelectric effect
   B. Piezoelectric effect
   C. Photoelectric effect
   D. Electromagnetic induction
   Answer is A
9. The hairs of a wet brush cling together because of
   A. Adhesion
   B. Diffusion
   C. Capillarity
   D. Surface tension
   Answer is D
   Hairs are held together by surface tension
10. Which one of the following is not a primary source of energy?
    A. Dry cell B. sun C. water D. wind
    Answer is A
11. A yellow object in red light appears
    A. Yellow B. red C. green D. black
    Answer is B
    Yellow will only transmit red
12. The equation below shows changes that occur when nuclides decays X to form Y
    $^{238}_{92}X \rightarrow {}^{230}_{88}Y$
    Which one of the following radiations are emitted?
    A. One alpha and two beta particle
    B. One beta and two alpha particles
    C. Two alpha particles and two beta particles
    D. Two alpha particles
    Answer is D
    It loses 2^4_2He particles
13. A body accelerates uniformly from rest and acquires a velocity of 60ms^{-1} after half a minute. Find the distance covered by the body.
    A. 15m B. 30m **C.** 900m D. 1800m
    Answer is C
    v = u + at
    60 = 0 + a x 30
    a = 2ms^{-2}
    s = ut = ½ at^2
    = ½ x 2 x 30^2
    = 900m

14. Which one of the following statements best explains what happens when a negatively charged cloud passes over the lightning conductor? The
    A. Negative charges are attracted to the cloud and positive ions are repelled to the spikes.
    B. Positive ions are attracted to the cloud and negative charges repelled to the spikes
    C. Negative charges are attracted from the earth to the spikes which causes ionization of air
    D. Positive ions and negative ions are lost to the earth.
    Answer is B
15. An observer produces sound and hears an echo after 6s. Find a distance between the observer and the reflecting surface. (speed of sound in air = 300ms^{-1})
    A. $\frac{300}{6\ x\ 2}m$ B. $\frac{300}{6}m$ C. $\frac{300\ x\ 6}{2}m$ D. 300 x 6
    Answer is C
    d = $\frac{vt}{2} = \frac{300\ x\ 6}{2}$
16. Which one of the following gives the correct number of protons, neutrons, and electrons in the atom $^{14}_{6}C$.

	Proton	Neutron	Electron
A.	6	14	6
B.	6	8	6
C.	8	6	6
D.	6	6	8

    Answer is B
17. Constructive interference of waves occurs when the two waves are
    (i) In phase
    (ii) Moving in opposite direction
    (iii) Have the same wavelength and frequency
    A. (i) only B. (ii) only C. (ii) and (iii) only D. (i) and (iii) only
    Answer is D
    Constructive interference occurs when a crest of one wave is superimposed on the crest of another wave
18. A current of 2A flows through a bulb for 10s. If the p.d across the bulb is 6V, find the work done.
    A. 120J B. 30J C. 3.3J D. 1.2J
    Answer is A
    Work = VIt = 6 x2 x10 = 120J
19. The figure below shows energy changes by two devices P and Q.

    P and Q are

	P	Q
A.	Dynamo	Motor
B.	Battery	Dynamo
C.	Battery	Motor
D.	Dynamo	Battery

    Answer is C

20. A force of 12N increases length of an elastic string by 5cm. find the force which increases the length by 2cm.
    A. 0.83N B. 4.80N C. 6.00N D. 10.0N
    Answer is B

5cm is caused by 12N

2cm is caused by $\frac{12\ x\ 2}{5}$ = 4.88N

21. When a wire carrying a current is placed between the poles of a magnet, it experiences a force due to
    A. Wire being attracted by the magnet
    B. Attraction between the north pole and south pole
    C. Interaction between the current and the magnetic field
    D. Interaction between the magnetic field between the poles and the field around the wire.

    Answer is D
22. The strength of a bridge can be improved by
    (i) Reinforcing the concrete used
    (ii) Designing the structure that is stronger in compression than tension
    (iii) Designing a structure that is stronger in tension than compression.

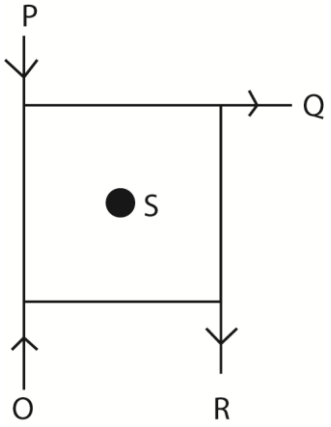
    A. (i) only B. (ii) only C. (i) and (ii) only D. (i) and (iii) only

    Answer is C
23. A solid measures 5cm x 4cm x 10cm. If the mass of the solid is 0.8kg, find the density in kgm^{-3}.

    A. $\frac{0.8\ x\ 10^{-6}}{5\ x\ 4\ x\ 10}$ B. $\frac{0.8}{5\ x\ 4\ x\ 10^{-6}\ x\ 10}$ C. $\frac{5\ x\ 4\ x\ 10\ x\ 10^{-6}}{0.8}$ D. $\frac{5\ x\ 4\ x\ 10}{0.8\ x\ 10^{-6}}$

    Answer is B

    Density = $\frac{mass}{volume}$
24. The figure below shows a rigid body pivoted at S



    Which of the forces O, P, Q and R gives the body ant-clockwise moment

    A. R B. Q C. P D. O

    Answer is P
25. An object of height 4cm is placed 20 cm from a convex lens. If the image formed is 6cm high, find the distance of the image from the lens

    A. $\frac{20\ x\ 4}{6}$ B. $\frac{20\ x\ 6}{4}$ C. $\frac{6\ x\ 4}{20}$ D. $\frac{20}{6\ x\ 4}$

    Answer is B

    M = $\frac{image\ height}{object\ height} = \frac{image\ distance}{object\ distance}$
26. Soft iron is used in telephone ear piece because it
    A. Loses magnetism easily
    B. Gains and does not lose magnetism easily
    C. Gains and loses magnetism easily
    D. Takes long to gain magnetism

    Answer is C

27. The figure below shows three forces of 3N, 4N and 13N acting on the body.

Find the magnitude and direction of resultant force.

A. 6N in the direction of the 13N force
B. 8N in the direction of 3N and 4N forces
C. 20N in the direction of the 13N force
D. 7N in the direction of the 3N and 4N forces

Answer is A

28. A car radiator is painted black and filled with water because

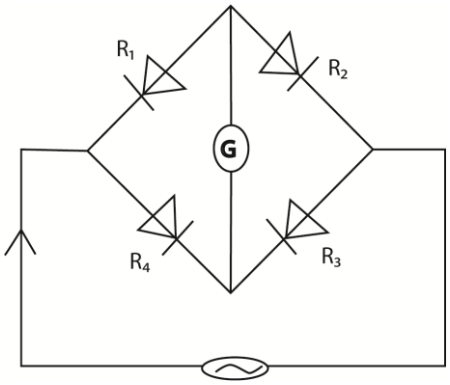
(i) Black bodies are good absorber of heat
(ii) Water facilitates heat transfer by convection
(iii) Water is a good conductor of heat

A. (i) and (ii) only B. (i) and (iii) only C. (iii) only D. (ii) only

Answer is A

(i) quickly absorbs heat from engine
(ii) this facilitates heat transfer from hot engine through water to surrounding air

29. The figure below shows rectifiers R_1, R_2, R_3 and R_4 connected in a circuit.



Through which of the rectifiers is current flow?

A. R_1 and R_2 B. R_1 and R_4 C. R_2 and R_4 D. R_2 and R_3

Answer is C

30. The temperature of 4kg of paraffin drops from 25^0C to 20^0C when it loses 44,000J of heat. Find the specific heat capacity of paraffin.

A. $5.50 \times 10 Jkg^{-1}K^{-1}$ B. $4.40 \times 10^2 Jkg^{-1}K^{-1}$ C. $2.44 \times 10^2 Jkg^{-1}K^{-1}$ D. $2.20 \times 10^3 Jkg^{-1}K^{-1}$

Answer is D

Heat = $mc\theta$

$44000 = 4 \times c \times (25 - 20)$

$C = 2.20 \times 10^3 Jkg^{-1}K^{-1}$

31. The mechanical advantage of simple machine may be increases by

(i) Increasing the load
(ii) Increasing weight of movable parts of the machine
(iii) Reducing friction between movable parts

A. (i) and (ii) only B. (i) and (iii) only C. (ii) and (iii) only D. (ii) only

Answer is B

32. The cost of using an electric appliance for 2hours is shs. 1600. If each unit of electricity costs shs. 50, find the power rating of the appliance in kW

A. $\frac{1600}{5\ x\ 2}$ B. $\frac{1600\ x\ 2}{50}$ C. $\frac{50\ x\ 2}{1600}$ D. $\frac{50}{2\ x\ 1600}$

Answer is A

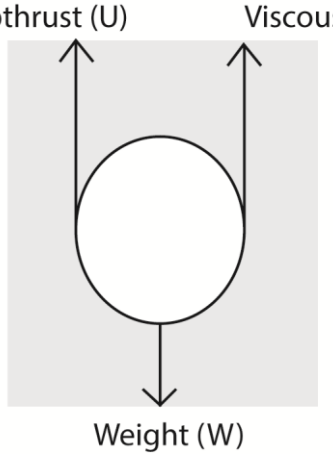
Cost = time x power x unit cost

1600 = 2 x 50 x kW

kW = $\frac{1600}{5\ x\ 2}$

33. A string was tuned to produce a note on a cold day. What adjustment should be made to make the string produce the same note on a hot day?
    A. tension in the string should be reduced.
    B. Length of the string should be increased
    C. Length of the string should be reduced
    D. Length of the string should be increased and tension reduced.

    Answer is C
34. The figure below shows forces U, F and W acting on a body A, falling freely in a fluid.



    The body moves with a steady velocity when

    A. F + W = U B. U –F = W C. U + W = F D. U + F = W

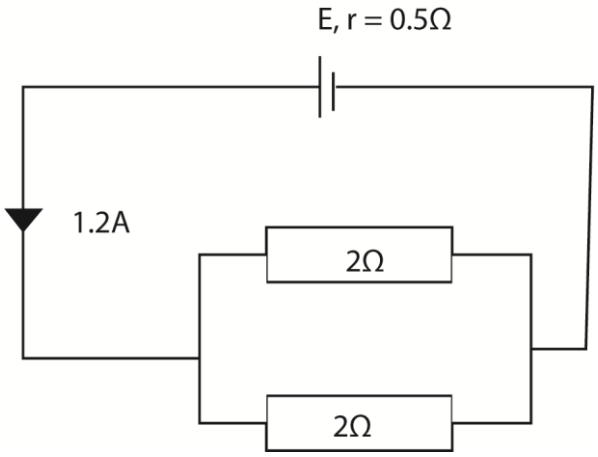
    Answer is D
35. Which one of the following explains the motion of smoke particles in an air cell? They
    A. Vibrate because they are being knocked by air particles
    B. Vibrate because they are continuously colliding with each other
    C. Move about randomly because they are knocked by air molecules
    D. Move about randomly because they are continuously colliding with each other.

    Answer is C
36. When cathode rays are passed between two identical plates, both connected to negative voltage, a horizontal line is formed on the screen. This shows that cathode rays
    (i) Travel in straight line
    (ii) Are deflected only towards the positive plate in an electric field
    (iii) Are not deflected when there is no electric field.

    A. (i) only B. (iii) only C. (i) and (iii) only D. (ii) and (iii) only

    Answer is B

37. The figure below shows a cell of e.m.f, E and internal resistance, r = 0.5Ω connected to two 2Ω resistors.



Find the value of E

A. 1.8V B. 2.4V C. 4.8V D. 5.4V

Answer is A

Total resistance = 0.5 + $\frac{2\ x\ 2}{2+"}$ = 1.5Ω

E = IR = 1.2 x 1.5 = 1.8V

38. Which of the following statements is correct about a step-up transformer? It
    (i) Has more turns of wire in the secondary coil than in primary
    (ii) Change alternating voltage from higher to lower value
    (iii) Change alternating voltage from lower to higher values

    A. (iii) only B. (i) only C. (i) and (iii)only D. (ii) and (iii) only

    Answer is C

39. A body of mass 3kg is acted on by a force of 20N. If the opposing force is 5N, find acceleration of the body

    A. 0.75ms^{-2} B. 5.0 ms^{-2} C. 6.67 ms^{-2} D. 8.30 ms^{-2}

    Answer is B

    Net force = 20- 5 = 15N

    a = $\frac{Force}{mass} = \frac{15}{3}$ =5.0 ms^{-2}

40. A car travelling at a speed of 72kmh^{-1} overcomes a resistance of 3N. Find the power developed by the engine of the car in watts.

    A. $\frac{72\ x\ 30\ x\ 1000}{3600}$ B. $\frac{30\ x\ 3600\ x\ 72}{1000}$ C. $\frac{30\ x\ 3600\ x\ 1000}{72}$ D. 72 x 3600 x 1000

    Answer is A

    P= F x V

    = 30 x $\left(72\ x\ \frac{1000}{3600}\right)$

Section B (40marks)

Answer all questions in this section

41. (a) What is meant by diffusion? (01mark)

    Is the spreading of molecules from a region of their high concentration to a region of their low concentration

    (b) State three factors which affect the rate of diffusion. (03marks)

    - temperature

    - size of molecules

- concentration gradient

42. (a) Explain the difference between electric conductors and insulators. (01mark)
Electric conductors allow passage of electricity while insulators do not.
(b) Describe how an electroscope is used to test whether a body is a good conductor or a good insulator.(03marks)

Electroscope is charged; a body under test is brought is brought in contact with the cap of electroscope. If the leaf falls, the material is a good conductor. If the leaf of the electroscope remain diverged, then the material is an insulator.

43. (a) Define density. (01mark)
Density is mass per unit volume
(b) A measuring cylinder is filled with water to 100cm^3 mark. An irregular stone of mass 150g is fully immersed into the water and the new level of water becomes 175cm^3. Calculate the density of the stone. (02marks)
Volume = 175 - 100 = 75cm^3
Density = $\frac{150}{75} = 2\ gcm^3$
(c) State any two factors that can increase the stiffness of a string. (01mark)

- reducing temperature

- increasing tension

- reducing length

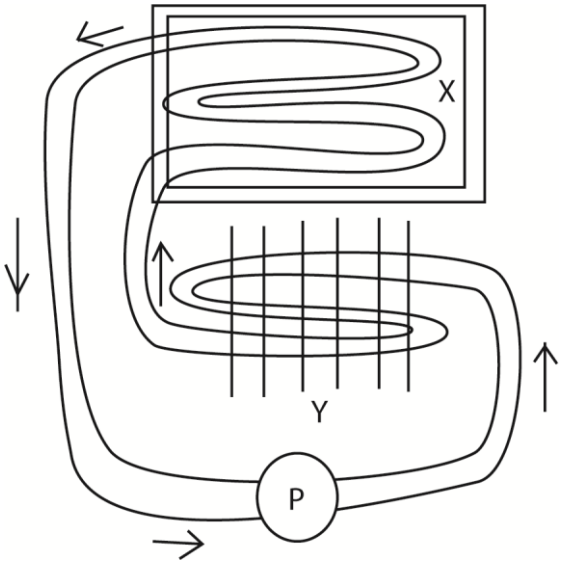
44. (a) What is meant by critical angle? (01mark)
Critical angle is the angle of incidence in an optically denser medium when the angle of refraction in less dense medium is 90^0
(b)(i) If the refractive index of water is 4/3; calculate the critical angle of water. (02marks)
Sin c = $\frac{1}{n} = 1 \div \frac{4}{3}$ = 0.75
c = 48.6^0
(ii) State one application of total internal reflection. (01mark)
- Optical fibre
- Prism binocular
- Prism periscope
- Formation of mirage

45. (a) Define the following
(i) Work (01mark)
Work is a product of force and distance moved in the direction of force
(ii) Energy (01mark)
This sis the ability to do work

(b) A pulley is used to raise a load of 40kg through 13m in 30s. Find the average power expended. (02marks)

P = $\frac{work\ done}{time\ taken} = \frac{F\ x\ d}{t} = \frac{40\ x\ 10\ x\ 13}{30}$ = 173W

46. The figure below shows essential parts of a refrigerator.



(a) Name the following section

X freezing compartment

Y – heat exchanger

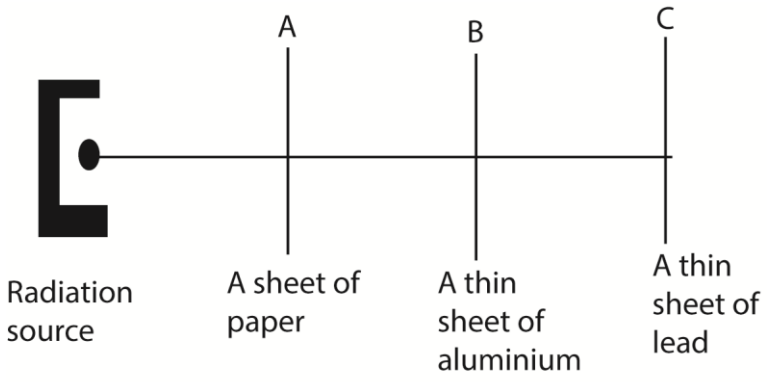
(b) Explain the function of section Y in the cooling cycle. (03marks)

The fins increase the surface area for heat loss

47. (a) Explain why alpha particles are more ionizing than beta particles. (02mark)

- Alpha particles have a bigger charge
- Alpha particles are slower taking longer time ionizing the air

(c) Radiations consisting of alpha particles, beta particles and gamma rays are released simultaneously from source, S, as shown in the figure below



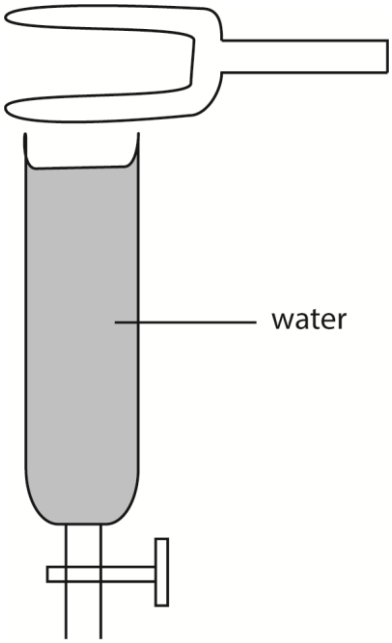
What radiations will be detected

(i) Between A and B (01mark): beta and gamma

(ii) Between B and C (½ mark): gamma

(iii) Beyond C (½ mark): gamma

48. (a) A sounding tuning fork held above the tube as shown below produces the first loud sound when air column is 31cm above the water surface. (velocity of sound in air is 320ms^{-1})



Find the frequency of the tuning fork. (03marks)

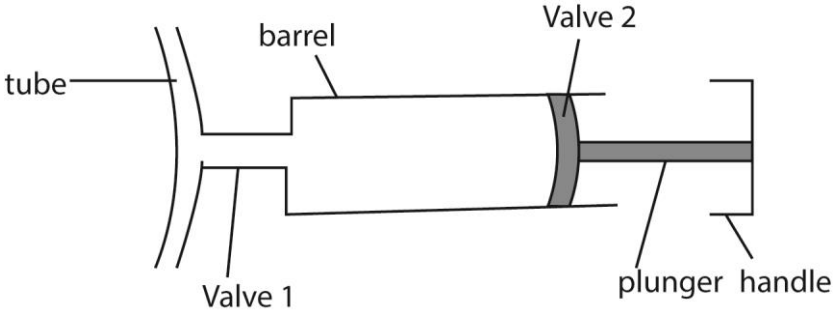
f $= \frac{V}{\lambda}$ but λ = 4L

$= \frac{320}{4\ x\ 0.31}$ = 258Hz

(b) Explain why nothing is heard when the length of the air column is less than 31cm. (01marks)

Length is less than the resonance distance

49. The figure below shows a pump used for inflating a bicycle tube



What happens when the handle is pulled outward?
Pressure inside the barrel drops; valve 1 close preventing escape air from the tube while valve 2 opens and atmospheric pressure forces air into the barrel

(b) (i) state the principle of transmission of pressure in fluids. (01mark)

When a fluid is completely enclosed in a vessel and pressure is applied to it at any point of its surface, pressure is transmitted equally throughout the fluid.

(ii) Why is air not suitable for transmitting pressure? (01mark)

Air is compressible and not all pressure will be transmitted

50. (a) Define electromotive force of a cell? (01mark)

Work done in driving a coulomb of charge around a circuit in which the cell is connected or p.d across open circuit

(b) List the defects of a simple cells.

- Local action
- polarization

(c) A charge of 20C flows through a resistance of 5Ω in 8s. Find the potential difference across the resistance. (02marks)

p.d = IR , but I = $\frac{Q}{t}$

= $\frac{20}{8}\ x\ 5$

= 12V

Thank you