Candidate's Name:

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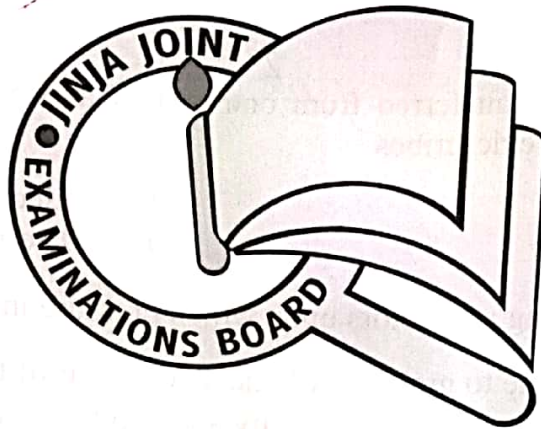| Random No.				Personal No.		

535/1
PHYSICS THEORY
Paper 1
December 2020
2 ¼ hours

JINJA JOINT EXAMINATIONS BOARD

Uganda Certificate of Education

MOCK EXAMINATIONS 2020

PHYSICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Section A contains **40** objective type questions. You are required to write the correct answer A, B, C or D against each question in the box on the right hand side.

Section B contains **10** structured questions. Answers are to be written in the spaces provided on the question paper.

Mathematical tables and silent non-programmable calculators maybe used.

Acceleration due gravity, g	=	10 m s^{-2}
Specific heat capacity of water	=	$4200 \text{ J kg}^{-1} \text{ K}^{-1}$
Velocity of light in air, c	=	$3.0 \times 10^{8} \text{ m s}^{-1}$
Density of water	=	1000 kg m^{-3}

For Examiner's Use Only

| Q.41	Q.42	Q.43	Q.44	Q.45	Q.46	Q.47	Q.48	Q.49	Q.50	MCQs	Total

SECTION A (40 MARKS)

*Answer **all** questions in this section.*

1. The spreading of molecules from a region of high concentration to a region of low concentration best describes

    A. Diffusion
    B. Capillarity.
    C. Saturated vapour pressure.
    D. Evaporation

2. Figure 1 shows magenta light shone onto a yellow colour filtering glass material.

Figure 1
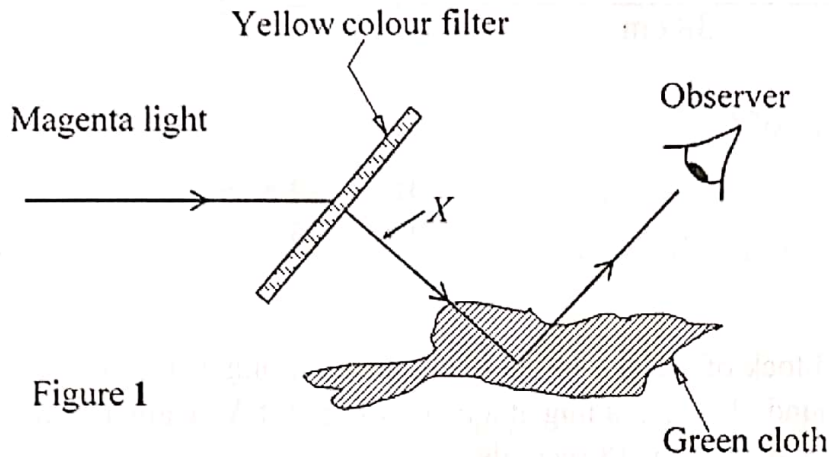
What colour is represented by ray X and how does the observer view the cloth.

	Ray X	Observer sees the cloth as
A.	Green	Green
B.	Red	Black
C.	Red	White
D.	Blue	Peacock blue

3. The process by which electrons are liberated from a metal cathode when an Ultra-violet radiation falls on the cathode is known to be

    A. Photoelectric effect.
    B. Thermionic emission.
    C. Radioactivity.
    D. Nuclear fusion.

4. Which of the following are true as applied to magnetism?

    (i) The right-hand grip rule states that; "Grip the solenoid with the right hand such that the fingers point in the direction of the current in the solenoid then, the thumb points to the South Pole".

    (ii) The pole of a magnet which, when the magnet is freely suspended, comes to rest while pointing (attracted) to the earth's geographical North Pole is known to be a north-seeking pole.

(iii)   The magnetic force is strongest (more concentrated) at the poles than the centre of the magnet.

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

5.   The form of energy transferred from one part of an object to another part owing to temperature difference describes

A.   Solar energy   B.   Electrical energy
C.   Nuclear energy   D.   Thermal energy

6.   Which of the following are factors upon which pressure in liquids depends?

A.   Acceleration due to gravity, volume, and colour of the liquid.
B.   Acceleration due to gravity, density and depth of the liquid.
C.   Weight, mass and density of the liquid.
D.   Density, volume and weight of the liquid.

7.   A body which is charged positively by rubbing is said to have,

A.   Lost electrons   B.   Gained protons
C.   Lost protons.   D.   Gained electrons

8.   The work of an extra high tension (E.H.T) power in an X-ray tube is to

A.   increase the kinetic energy of the emitted electrons so as to move to the target.
B.   protect the X-ray tube from an external electric and magnetic fields.
C.   heat the filament so as to emit many electrons.
D.   heat the metal cathode so as to emit many electrons.

9.   The type of a wave in which the particles of the wave medium oscillate perpendicular to the direction of the wave travel best describes

A.   Longitudinal wave.   B.   Sound wave
C.   Transverse wave   D.   Waves in a spring.

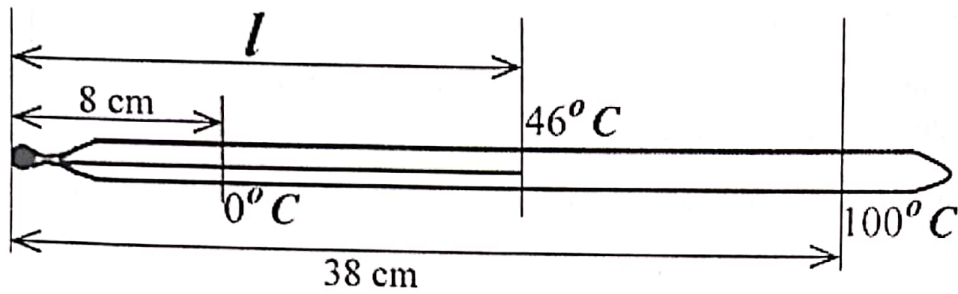10.   The state of a body in which the resultant force due to forces acting on it is zero best defines

A.   Stability   B.   Equilibrium
C.   Center of gravity.   D.   Principle of moments

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11. Figure 2 shows the readings on an un-calibrated thermometer which was placed in a liquid whose temperature was $46^0 C$.

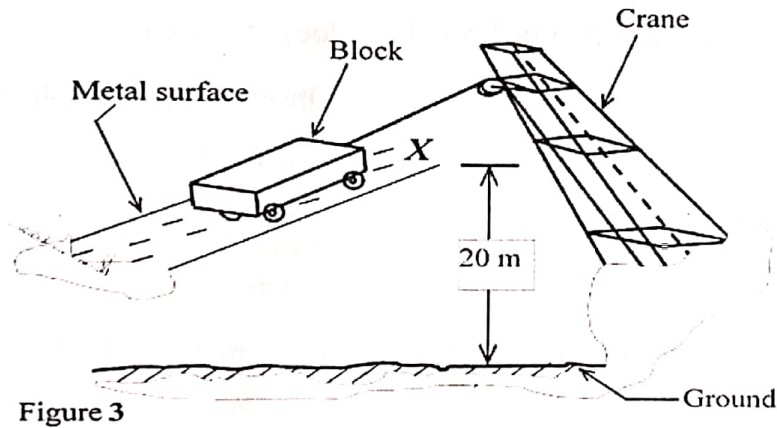Determine the value of *l*.   Figure 2

A.   21.8 cm   B.   13.8 cm
C.   14.5   D.   33.7

12. Figure 3 shows a block of weight 450 N being pulled along a frictionless metal surface inclined to the ground, during loading at a factory to point X, using a crane which works at a rate of 600J per second for 18 seconds.

Figure 3

If point X is 20m above the ground, determine the efficiency of the system.

A.   83.3%   B.   75.0%
C.   90.0%   D.   66.7%

13.   Figure **4** shows a body whirled in a vertical circular path. When the body is at P, the total force on it is 14 N and X is the center of the circular path.
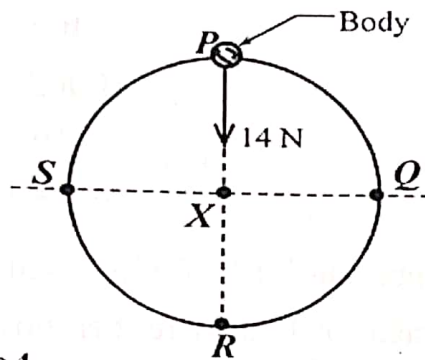

Figure **4**

If the mass of the body is 800g , where $\overline{SQ}$ and $\overline{PR}$ are horizontal and vertical diameters of the path, determine the resultant force on the body when it is at point S.

A.   14 N
C.   6 N

B.   8 N
D.   10 N

14.   A radioactive nuclide has 20 years as its half-life. What is the original mass of the nuclide if 0.403g will have decayed after 100 years?

A.   0.416g
C.   0.013g

B.   0.429g
D.   0.202g

15.   Two 4Ω resistors are connected in series with each other and then connected to the battery of e.m.f $12V$. Determine the current flowing in the circuit if the battery has no internal resistance.

A.   1.5 A
C.   3.0 A

B.   0.67 A
D.   0.33 A

16.   In an attempt to estimate the depth of a sea, an ultrasonic sound of frequency 250 Hz was sent into the sea and it took 20 s to hear the reflected wave. If the speed of sound in water is 500 m s $^{-1}$, calculate the depth of the sea.
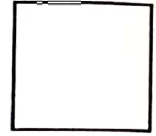
A.   10000 m
C.   40 m

B.   5000 m
D.   6250 m

17. An object of mass 240g is lifted through a height of 20 m in 0.5 minutes. Determine the power developed in the system.

A. $\dfrac{240\times1000}{20\times0.5\times60}$ B. $\dfrac{240\times10\times20}{1000\times0.5\times60}$

C. $\dfrac{240\times1000\times20}{0.5\times60\times10}$ D. $\dfrac{20\times60\times0.5}{240\times1000}$

18. Water of volume 250 cm³ at a temperature of $120^{o}\,C$ is mixed with milk of heat capacity $2173.6\,J\,K^{-1}$. The final temperature of the mixture after stirring gently becomes $75^{o}\,C$. Calculate the initial temperature of milk.

A. $45^{o}\,C$ B. $53.3^{o}\,C$

C. $6.4^{o}\,C$ D. $85.3^{o}\,C$

19. The primary coil of a transformer of 500 turns is connected to a power source of 450 V. If the secondary coil has 200 turns, determine the current supplied to the resistance of 50 Ω connected to the secondary coil.

A. 0.056 A B. 3.600 A
C. 9.000 A D. 0.278 A
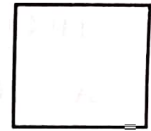
20. The image formed on the film of a pin-hole camera is $\dfrac{2}{3}$ the object size. The sum of the object and image distances, is 40 cm. Determine the camera length.

A. 30.0 cm B. 26.7 cm
C. 8.0 cm D. 16.0 cm

21. Which of the following is true about soft magnetic materials?

A. They are used for making permanent magnets.
B. They are examples of paramagnetic materials.
C. They are used for making electromagnets.
D. They take long to be magnetized and once magnetized, they retain their magnetism for a long time
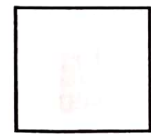
22. A piece of paper is held with its plane lying horizontally. When air is blown over its top surface, the free end of the paper is seen rising. Which of the following best describes the observation?

A. Streamline flow. B. Up-thrust due to air.
C. Bernoulli's principle. D. Turbulent flow.
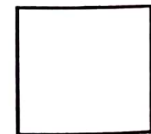
23. Figure **5** shows a lay out of the apparatus to demonstrate the magnetic effect on a current carrying conductor.
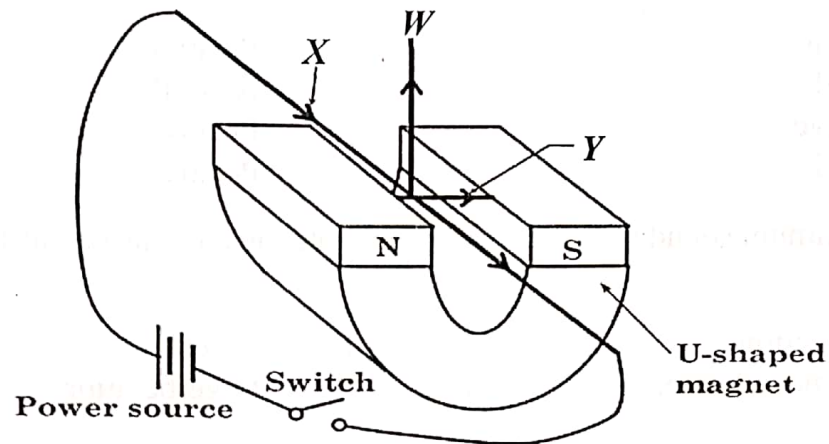
Figure 5

What do the letters *W*, *X* and *Y* represent?

	W	X	Y
A.	Current	Magnetic field	Force on conductor
B.	Force on conductor	Current	Magnetic field
C.	Force on conductor	Magnetic field	Charge flow
D.	Charge flow	Current	Force on conductor

24. Figure **6** shows a positively charged pith ball well lowered into a hollow conducting can.
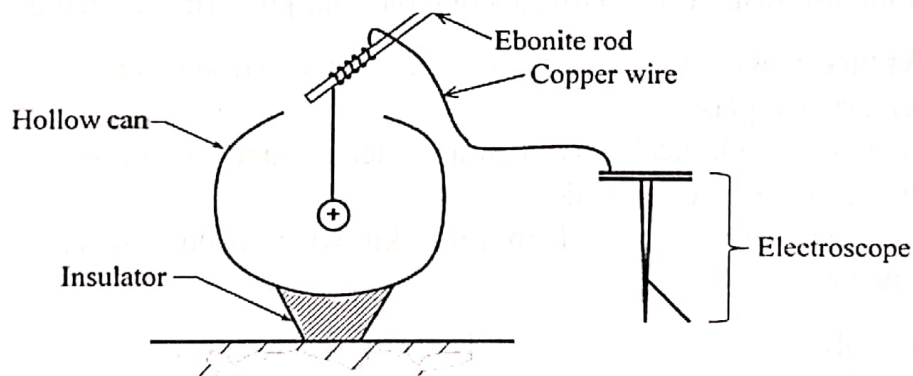
Figure 6

When the ball touches the bottom of the can, what will be the charge on the ball and the electroscope?

	Ball	Electroscope
A.	Positive	Positive
B.	Neutral	Neutral
C.	Negative	Positive
D.	Neutral	Positive

25. The first maximum sound note that can be generated in any musical instrument is known to be

A. First overtone B. An echo
C. Fundamental note. D. Reverberation

26. Which of the following are properties of X-rays?

(i) Blacken a photographic plate.
(ii) Do not require a material medium for transmission.
(iii) They greatly ionize gas molecules.
(iv) They produce cathode rays when they strike matter.

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

27. Which of the following is (are) true about molecular properties of matter?

(i) Mercury makes an upward meniscus due to strong adhesive forces between mercury and glass.
(ii) Water forms spherical balls when sprinkled on soot due to stronger cohesive forces between the water molecules.
(iii) Water gets easily removed from the skin when using a towel by the process of diffusion.

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

28. The pressure of a fixed mass of an ideal gas is directly proportional to its absolute temperature provided the volume of the gas remains constant best describes

A. Charles' law B. Boyle's law
C. Equation of a state. D. Pressure law.

29. Which of the following shows the correct arrangement of magnetic domains in un-magnetized magnetic material?

A.

B.

C.

D.
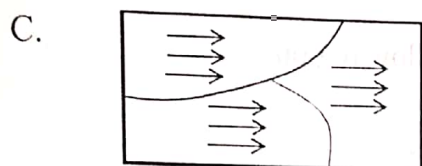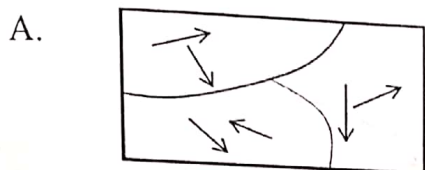
30. Which of the following is (are) true as applied to reinforced concrete?

(i)   It is weak under tension and strong under compression.
(ii) It is resistant to harsh weather conditions such as flooding.
(iii) It is resistant to fire.

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

31. A student of S.3 writes the following statements in an attempt to answer some questions. Which of the following are correct?

(i)   Evaporation takes place at any temperature.
(ii) In the freezer compartment of a refrigerator, the volatile liquid absorbs latent heat from the food and becomes vapour at low pressure.
(iii) When ice from water is put under high pressure, its melting point becomes low.
(iv) When cold water is poured on a round bottomed flask containing hot water, the pressure inside increases and water is seen boiling at a higher temperature.

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

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32. Figure **7** shows a wave pattern obtained in a ripple tank experiment when demonstrating refraction.
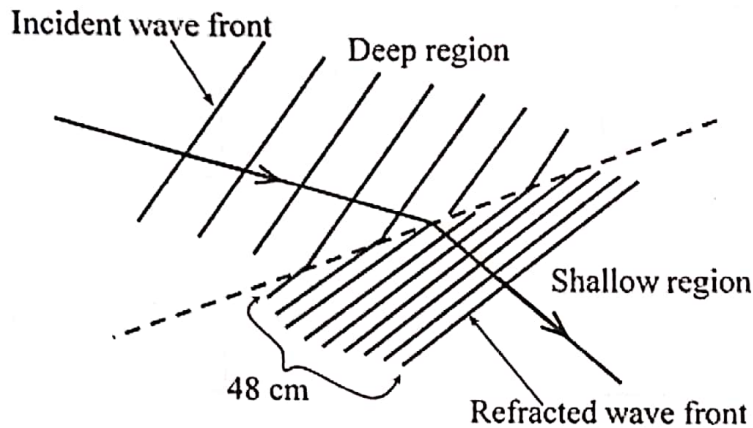
Figure 7

If the speed and wavelength of the incident wave are 10 m s $^{-1}$ and 12 cm respectively, determine the speed of the refracted wave.

A. $\dfrac{6\boxtimes1000}{12\boxtimes100}ms^{\boxtimes1}$

B. $\dfrac{6\boxtimes100}{12\boxtimes100}ms^{\boxtimes1}$

C. $\dfrac{6\boxtimes12}{1000}ms^{\boxtimes1}$

D. $\dfrac{6\boxtimes10\boxtimes12}{10000}ms^{\boxtimes1}$

33. Water is poured into a beaker to a level of 200 cm³. When an object of density 800 kg m^{-3} is completely submerged in the water, water rises to 320 cm³. Determine the mass of the object.

A. $\dfrac{120\boxtimes800}{1000000}kg$

B. $\dfrac{100000}{12\boxtimes800}kg$

C. $\dfrac{12\boxtimes1000000}{800}kg$

D. $\dfrac{10000\boxtimes800}{120}kg$

34. Which of the following parts of a lens camera has the same function in the camera as a retina in the human eye?

A. Shutter   B. Focusing knob

C. Diaphragm   D. Film

35. Which of the following are correct as applied to heat energy?

(i) Ice from frozen water floats on water because during freezing, water in solid form has a bigger volume than in liquid form for the same mass.

(ii) In desert countries, houses are painted white because white is a poor absorber of heat as well as a good reflector of heat.

(iii) At night, land cools faster than water and therefore, cool air blows from the sea to land as warm air from the land raises up.

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

B. (i), (ii) and (iii)
D. (ii) and (iii) only

36. A radioactive nuclide Uranium-238, $^{238}_{92}U$ disintegrates by emission of two alpha particles to nuclide W. Which of the following is a true chemical representation of W?

A. $^{246}_{96}W$

B. $^{234}_{90}W$

C. $^{230}_{88}W$

D. $^{240}_{94}W$

37. Figure **8** shows a ray diagram of a person looking at an object which is 25 cm from his eye. The image is formed behind the retina.
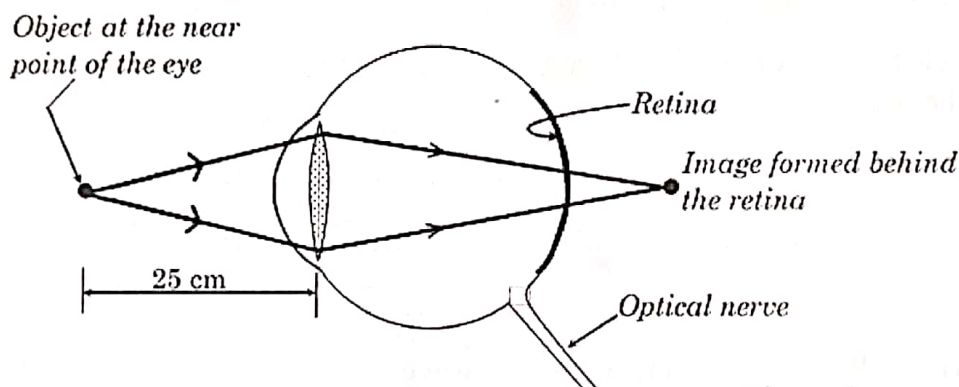
Figure 8

Which of the following is the eye defect the person is suffering from?

A. Short sightedness
C. Long sightedness

B. Astigmatism
D. Colour blindness

38. When one joule of electrical work is done to move one coulomb of charge from one point of a conductor to another, the potential difference involved is known to be

A. Electromotive force.
C. A volt.

B. Terminal p.d
D. Ampere

39. An object moving at a speed of 20 m s $^{-1}$ attains a maximum speed of 50 m s $^{-1}$ in 15 seconds. Calculate the distance covered in this time interval.

A. 525 m
C. 85 m

B. 315 m
D. 75 m

40. Determine the cost of using seven $500W$ bulbs, a $1000\ W$ refrigerator and a $400\ W$ TV set altogether for two hours a day in 3 days if each unit of electricity costs shs 640.

A. shs 18816   B. shs 188160
C. shs 451584   D. shs 150528

SECTION B (40 MARKS)

Answer **all** *questions in this section. All working must be shown clearly in the spaces provided.*

41. (a) Define the term **linear momentum**.   *(01 mark)*

    ....

    ....

    (b) A body of mass $2.4kg$ moving at a velocity of $12ms^{-1}$ accelerates uniformly to a velocity of $36ms^{-1}$ in 10 seconds. Determine the rate of change of momentum of the body.   *(03 marks)*

    ....

    ....

    ....

42. (a) (i) What is an **electromagnetic wave**?   *(01 mark)*

    ....

    ....

    (ii) State any **two** properties of electromagnetic waves.   *(01 mark)*

    ....

    ....

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(b) Figure **9** shows a plane water wave moving from left to right. When a barrier with two holes which are smaller than the wave length of the wave is placed in front of the wave, complete the diagram to show the resulting wave fronts.

(02 marks)

Hole in barrier

Plane Wave front

Figure 9

Barrier
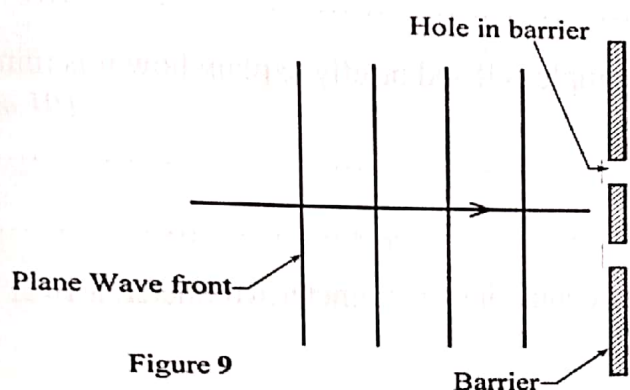
10

43. (a) Figure **10** shows a simple sketch diagram of an *X*-ray tube.

E.H.T

Vacuum

Tungsten target

Low voltage

B

A
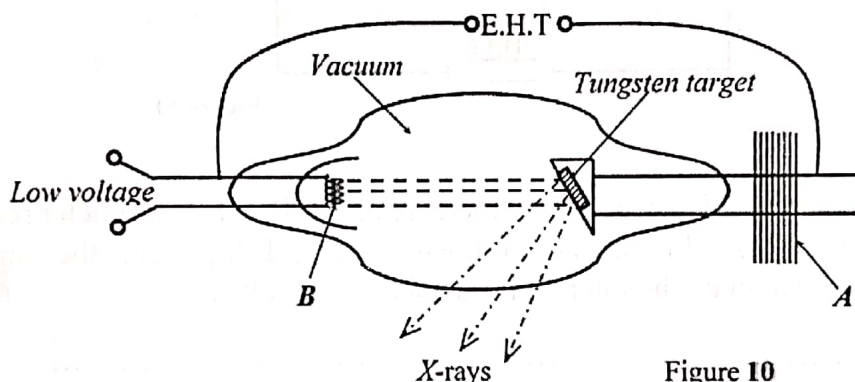
X-rays   Figure **10**

(i) Name parts labeled *A* and *B*   *(01 mark)*

A ....

B ....

(ii) What is the function of each part labeled in (a) (i) above? *(01 mark)*

A ....

B ....

(b) Briefly explain why,

(i) the target is made of tungsten.   *(01 mark)*

....

(ii) the tube has a vacuum.   *(01 mark)*

....

44. (a) (i) What is a **primary cell**? *(01 mark)*

....

     (ii) State **one** defect of a simple cell and briefly explain how it is minimized.
(01 mark)

....

....

(b) Figure **11** is a circuit diagram containing an ammeter, voltmeter, a 10 Ω resistor, a cell and a switch.
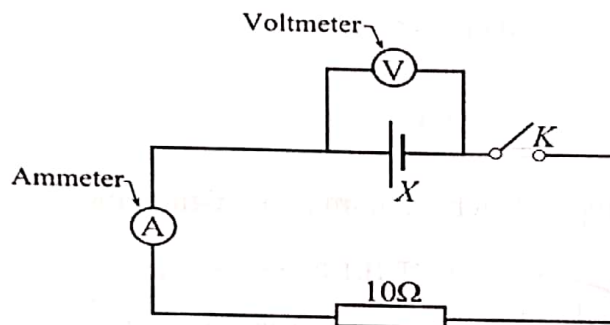
Figure 11

When switch, **K** is open, the voltmeter reads $1.5V$ and the ammeter reads 0A. When the switch is closed, the voltmeter reads $1.25V$ and the ammeter reads $0.125 A$. calculate the internal resistance of the cell **X**. *(02 marks)*

....

....

....

45. (a) Define **acceleration due to gravity**. *(01 mark)*

....

....

(b) A body is released from rest a height of 60 m above the ground. At a height of 36m above the ground, determine the velocity of the body as it moves downwards. *(03 marks)*

....

....

....

46. (a) Describe briefly how the polarity of a steel bar magnetized by electricity can be obtained by using the direction of flow of current. *(02 marks)*

....

....

....

(b) In the space provided, draw a magnetic field pattern due to a straight wire carrying current into a paper. *(01 mark)*

(c) State any **two** ways the magnetic field due a straight wire carrying current can be increased. *(01 mark)*

....

....

47. (a) (i) What is **radioactivity**? *(01 mark)*

....

....

(ii) State any **one** difference and **one** similarity between alpha and beta particles. *(02 marks)*

Difference. ....

Similarity. ....

(b) An element H has an atomic mass of 250. Fill the table below. *(01 mark)*

Number of protons	Number of electrons	Number of neutrons
....	138	....

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48. (a) Define the term **specific heat capacity**. (01 mark)

....

....

(b) Figure 12 shows a heating curve for water being supplied heat by an immersion heater of power rating $300W$. The mass of water is 2.5 kg.

Temperature (θ)

$60^o C$

$0^o C$

4   8   12   Time (s)

$-15^o C$

Figure 12
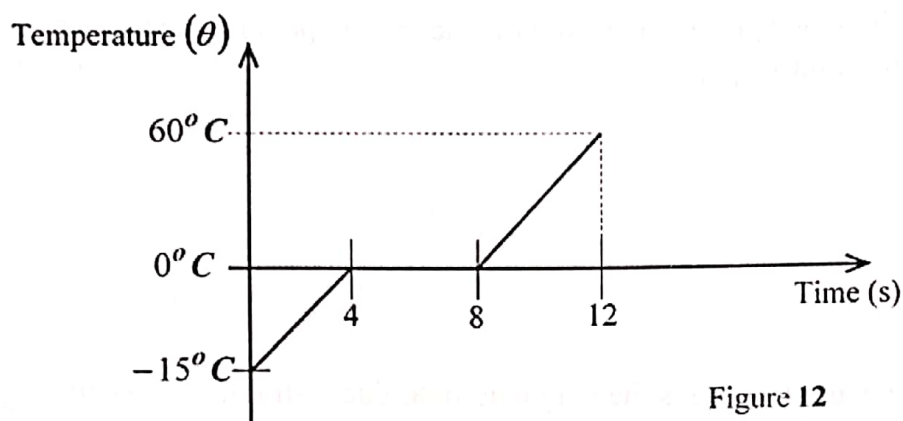
Calculate the total heat supplied in the first eight seconds. (*Specific latent heat of fusion of water is 356000 J kg⁻¹ and specific heat capacity of ice is 2100 J kg⁻¹ K⁻¹*) (03 marks)

....

....

....

....

49. (a) Calculate the power of a convex lens whose focal length is 20 cm. (02 marks)

....

....

....

(b) Figure 13 shows an object, *O* placed in front of a thin convex lens of principal focus *F* and centre of curvature *C*. Complete the ray diagram to show the formation of the image, hence state any two characteristics of the image formed.
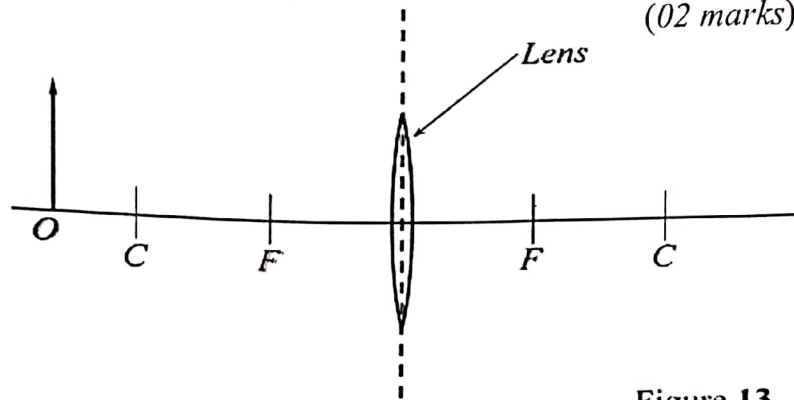
(02 marks)

Figure 13

Characteristics. ....

....

50. (a) State **Archimedes' principle.** *(01 mark)*

....

....

....

(b) State any **two** daily life applications of **Archimedes' principle.** *(01 mark)*

....

....

(c) Explain why a ship cannot sink in a sea yet it is made of metals. *(02 marks)*

....

....

....

....

....