

1

Name Class/Number.....

S.3 PHYSICS 1

Instructions: Attempt all questions. Answers to questions in Section A should be written in the table provided on page One. Answers to questions in Section B should be written in the space provided against each question. Assume where necessary; Acceleration due to gravity, $g = 10\text{ms}^{-2}$

SECTION A

1. 6. 11. 16. 21. 26. 31.

2. 7. 12. 17. 22. 27. 32. 3. 8. 13. 18. 23. 28. 33. 4. 9. 14. 19. 24. 29. 34. 5. 10. 15. 20. 25. 30. 35.

1. Which of the following is the best conductor of heat?

A. Silver B. Iron C. Copper D. Aluminium

2. A man takes one minute to lift 4 bags of sugar each of weight 50N through a height of 1.5m. Calculate the power expended.

A. 1.25W B. 5.00W C. 75.00W D. 300.00W

3. The three fundamental units of measurements are

A. Mass, length, time B. Mass, frequency, power C. Metres, seconds, kilograms D. Seconds, metres, grams

4. A school nurse applies a force of 30N to a syringe. Given that the cross sectional area of the tip of the needle is $1.0 \times 10^{-7}\text{m}^2$. Calculate the pressure produced at the tip of the needle.

A. $3.0 \times 10^7 \text{ Pa}$ B. $4.0 \times 10^7 \text{ Pa}$ C. $3.0 \times 10^8 \text{ Pa}$ D. $2.5 \times 10^8 \text{ Pa}$

5. A rectangular block of metal weighs 5 N and measures 2 cm \times 3 cm \times 4 cm. What is the least pressure which it can exert on a horizontal surface?

A. $2.10 \times 10^{-7} \text{ Pa}$ B. $4.17 \times 10^3 \text{ Pa}$ C. $6.25 \times 10^{-5} \text{ Pa}$ D. $8.30 \times 10^{-5} \text{ Pa}$

6. Which one of this material is NOT attracted by a magnet?

A. Copper B. Cobalt C. Nickel D. Iron

7. A block exerts a pressure of 40,000pa on the ground. Calculate its mass if its area in contact with ground is $6.0 \times 10^{-4}\text{m}^2$

A. 24 kg B. 4.8 kg C. 2.4 kg D. 48 kg

2

8. Find the velocity ratio of an inclined plane of length 12m if the height from the ground is 3m.

A. 6 B. 2 C. 4 D. 3

9. In the crushing can experiment, the can collapses because

A. It is weakened by the hot water B. Pressure outside is greater than pressure inside C. Pressure inside is greater than pressure outside D. Pressure inside is atmospheric.

10. A simple machine has a velocity ratio of eight and needs an effort of 10N to lift a load of 50N. What is the efficiency of the machine?

A. 100% B. 62.5% C. 20% D. 2.5%

11. An object in unstable equilibrium continues to fall when slightly displaced because its

(i) Centre of gravity is lowered (ii) Center of gravity is raised. (iii) Potential energy is reduced (iv) Potential energy is increased. A. (i) , (ii) and (iii) only. B. (i) and (iii) only C. (ii) and (iii) only D. (iv) only

12. Current is measured by

A. a battery B. a voltmeter C. an ammeter D. a motor

13.

In the figure above, a fixed mass of dry gas is trapped in bulb M. Determine the total pressure of the gas in M, given that the atmospheric pressure is 760mm of mercury.

A. 114cm Hg B. 106cm Hg C. 30cm Hg D. 46cm Hg

14. The focal length of a concave mirror is the

A. distance between the pole of the mirror and the focal point B. distance between the centre of curvature and the mirror. C. distance between the object and the image D. diameter of the mirror.

3

15. An eclipse of the sun occurs when the

A. Earth passes between the moon and the sun. B. Moon passes between the sun and the earth. C. Sun passes between the moon and the earth. D. Sun, the moon and the earth are not in a straight line.

16. An object is placed 30 cm in front of a plane mirror. If the mirror is moved through a distance of 6 cm towards the object, find the distance between its image and its object.

A. 24 cm B. 36 cm C. 48 cm D. 60 cm

17. A body of mass 30 kg weighs 60N on planet X. Which one of the following statements is true?

A. The acceleration due to gravity on X is greater than that on earth. B. The mass of the body is greater on X than it is on the earth. C. The acceleration due to gravity on X is less than that on the earth. D. The mass of the body is less on X than it is on the earth.

18. In a convex mirror, the image formed is always

A. real and upright B. virtual and upright C. real and inverted D. virtual and inverted

19. An object 6 cm high is placed 24 cm from a tiny hole in a pin-hole camera. If the distance from the pin hole to the screen is 8 cm, find the size of the image on the screen.

A. 0.2 cm B. 2.0 cm C. 18.0 cm D. 32.0 cm

20. Diffuse reflection occurs when

A. a parallel beam of light is reflected in all directions B. a parallel beam of light falls on a highly polished surface. C. a parallel beam of light is reflected as a parallel beam of light. D. the angles of incidence of rays the beams are equal to the angles of reflection.

21. A concave mirror of focal length 10 cm forms an erect image 30cm from the mirror. What is the object distance from the mirror?

A. 7.5cm B. 15.0 cm C. 10.0 cm D. 1.5cm

22. The rate at which work is done:

A. watts B. joules C. power D. work done

23. An ungraduated thermometer is attached to a centimetre scale and reads 7.5 cm in pure melting ice and 23.5 cm in steam at 100oC and 5.5 cm in a body. What is the temperature of the body?

A. -23.4oC B. 12.5oC C. -12.5oC D. 34.4o

24. A measuring cylinder contains 8 cm³ of water. A small piece of an irregular object of mass 24g is lowered carefully into the measuring cylinder so that it is completely submerged. If the density of the object is 8gcm⁻³, then new reading of the level of water in the cylinder is:

A. 8.3 cm³ B. 32 cm³ C. 11 cm³ D. 40 cm³

4

25. A sea breeze occurs:

A. when cool air blows towards land. B. when warm air blows towards the land. C. during night. D. when cool air blows towards sea.

26. The force which acts towards the centre and keeps a body in a circular path is called:

A. centrifugal force. C. centripetal force. B. gravitational force. D. frictional force.

27.

The figure shows a simple barometer. The height of the mercury column is 76cm. When the tube is slightly tilted, the height of the mercury column will

A. be slightly higher than 76cm B. be lower than 76cm C. not change D. oscillate about 76cm

28. Which of these is not a renewable source of energy?

A. The sun B. Wind C. Natural gas D. Ocean tidal energy

29. A ray of light passing through the.....retraces its path.

A. Principle focus B. Centre of curvature C. Pole D. Aperture

30. A body is in neutral equilibrium if

(i) It returns to its original position after a small displacement (ii) Its centre of gravity remains at the same height when slightly displaced. (iii) It overturns when slightly displaced. A. (i) only B. (i) and (ii) C. (ii) only D. (ii) and (iii)

31. On a cool day, a metal feels cold to the touch because

A. metals contain less heat. B. the temperature of the metal is the same as that of the surroundings. C. the temperature of the metal is less than that of the surroundings. D. the metal conducts the heat away from the hand.

32. A hippopotamus can easily walk on mud without sinking while a goat will sink because

A. a hippopotamus has more weight than a goat. B. the centre of gravity of a hippopotamus is lower than that of a goat. C. a hippopotamus exerts more pressure on the ground than a goat. D. a hippopotamus exerts less pressure on the ground than a goat.

33. An object is placed between the focal point and the centre of curvature of a concave mirror. Which of the following fully describes the image formed?

A. Real, inverted, magnified B. Virtual, erect, magnified C. Real, inverted, diminished D. Real, erect, diminished.

5

34. Soft magnetic materials are materials which;

A. Can be magnetized easily. B. Can retain their magnetism for a long time C. Can break easily D. Cannot be attracted by a magnet.

35.

The block and tackle pulley system above has an efficiency of 80%. The load which it can lift by an effort of 10 N is

A. 4 N B. 8 N C. 40 N D. 50 N

SECTION B (25 MARKS)

36. (a) State the principle of conservation of energy. (1 mark)

(b)

The Figure above shows a hydroelectric generating system. State the energy transformations that occur during the generation of hydroelectric power in the correct order in which they occur. (2 marks)

Dam

Turbines Water

6

(c) Explain briefly the shape of the dam. (2 mark)

37. (a) Define the term Moment of a force (1 mark)

(b) State the principle of moments. (1 mark)

(c) A uniform metre rule is balanced at the 30cm mark when a load of 0.80N is hung at the zero mark.

(i) At what point on the rule is the centre of gravity of the rule? (1 mark)

(ii) Calculate the weight of the rule. (1 marks)

38. (a) What are consequent poles? (1 mark)

(b) During a physics experiment, a student was provided with two bar magnet, and a steel rod. Briefly describe using necessary diagram how you can produce consequent poles. (3 marks)

7

39. A screw jack has a screw of pitch 5mm and the length of the handle is 200mm. it needs an effort of 30N to lift a load of 3000N. (a) Define the term pitch of a screw. (1 mark)

(b) Calculate the (i) Mechanical advantage (1 mark)

(ii) Velocity ratio (1 mark)

(iii) Efficiency (1 mark)

40. (a) State Pascal's principle. (1 mark)

8

(b)

The figure above shows a block made of a material whose density is 1250 kg m^{-3} and it measures $10 \text{ cm} \times 20 \text{ cm} \times 40 \text{ cm}$. Find (i) the mass of the block. (2 marks)

(ii) the maximum pressure it exerts. (1 mark)

41. (a) (i) Define the term atmospheric pressure as used in Physics. (1 mark)

(ii) Name the instrument used to measure atmospheric pressure (1 mark)

(b) Explain the working of a drinking straw. (2 marks)

END.

40 cm

10 cm

20 cm

9

X 60

× 100%

MARKING GUIDE Name Class/Number.....

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A. 4 N B. 8 N C. 40 N D. 50 N

SECTION B (25 MARKS)

36. (a) State the principle of conservation of energy. (1 mark)

The principle of conservation of energy states energy can neither be created nor destroyed but it can be converted from one form to another.

(b)

The Figure above shows a hydroelectric generating system. State the energy transformations that occur during the generation of hydroelectric power in the correct order in which they occur. (2 marks)

Dam

Turbines Water

14

(c) Explain briefly the shape of the dam. (2 mark)

The thickness of the wall of a dam increases downwards because the deeper it is, the greater the water pressure. The water at the bottom of the dam is at the higher pressure than at the top. Hence, the wall of the dam has to be thicker at the base to sustain this higher water pressure.

37. (a) Define the term Moment of a force (1 mark)

The moment of a force about a point is the product of the force and the perpendicular distance of its line of action from the point.

(b) State the principle of moments. (1 mark)

If a rigid body is in equilibrium, then the sum of the clockwise moments about any point is equal to the sum of the anticlockwise moments about the same point.

(c) A uniform metre rule is balanced at the 30cm mark when a load of 0.80N is hung at the zero mark.

(i) At what point on the rule is the centre of gravity of the rule? (1 mark) At 50.0cm mark.

(ii) Calculate the weight of the rule. (1 marks)

Let W be the weight of the metre rule. $W \times 20 = 0.8 \times 30$

$W =$

$0.8 \times 30 \div 20 \quad W = 1.2N$

38. (a) What are consequent poles? (1 mark)

A magnet is said to have consequent pole when it has like poles on both ends. Consequent poles are obtained by double stroke method using like poles of a bar magnet.

(b) During a physics experiment, a student was provided with two bar magnet, and a steel rod. Briefly describe using necessary diagram how you can produce consequent poles. (3 marks)

15

The steel bar is stroked simultaneously from the centre (or from the ends) using two like poles of magnets as shown above. The stroking begins at the middle of the steel needle each time making sure that the two bar magnets are lifted far away from the steel bar once the end is reached. The polarity of the steel bar is tested. It is observed that the ends gain like poles hence consequent poles are formed.

39. A screw jack has a screw of pitch 5mm and the length of the handle is 200mm. it needs an effort of 30N to lift a load of 3000N.

(a) Define the term pitch of a screw. (1 mark)

A pitch is the distance between two successive threads measured along the axis of the screw.

(b) Calculate the (i) Mechanical advantage (1 mark)

$M.A =$

$L \div E$

$M.A =$

3000 30 **$M.A = 100$** (ii) Velocity ratio (1 mark)

$$V.R =$$

$2\pi r$ pitch

$$V.R =$$

$$2 \times$$

$$22.7$$

$$\times 200.5$$

$V.R = 251.43$ (iii) Efficiency (1 mark)

$$\eta =$$

$M.A V.R$

$$\times 100\%$$

$$\eta =$$

$$100 \times 251.43$$

$$\times 100\%$$

$$\eta = 39.8\%$$

40. (a) State Pascal's principle. (1 mark)

When a fluid completely fills a vessel, and a pressure is applied to it at any part of the surface, that pressure is transmitted equally throughout the whole of the enclosed fluid.

16

(b)

The figure above shows a block made of a material whose density is 1250 kg m^{-3} and it measures $10 \text{ cm} \times 20 \text{ cm} \times 40 \text{ cm}$. Find (i) the mass of the block. (2 marks)

$$\rho = \frac{m}{v} \text{ where } \rho \text{ is density, } m \text{ is mass and } v \text{ is volume. } m = \rho \times v \quad m = 1250 \times 10 \times 20 \times 40 \times 10^{-6} \\ = 10 \text{ kg}$$

(ii) the maximum pressure it exerts. (1 mark) $P = \frac{F}{A}$ where F is force, A is area and P is pressure $P = \frac{40 \times 10 \times 10}{10 \times 10} = 5000 \text{ N}$

41. (a) (i) Define the term atmospheric pressure as used in Physics. (1 mark)

This is the pressure air exerts on all objects in the atmosphere including the Earth's surface (ii) Name the instrument used to measure atmospheric pressure (1 mark) Barometer

(b) Explain the working of a drinking straw. (2 marks)

When the air is sucked out of the straw, the pressure inside the straw reduces due to the high speed of the air molecules. The atmospheric pressure acts on the liquid outside and it pushes the liquid into the straw up to the mouth.

END.