

**SINGAPORE POLYTECHNIC SCIENCE ENTRANCE TEST**

Name : \_\_\_\_\_

In chinese (if applicable): \_\_\_\_\_

Passport / ID No: \_\_\_\_\_

Seat No: \_\_\_\_\_

Test Venue: \_\_\_\_\_

Date: \_\_\_\_\_

**Time Allowed: 1½ hours**

---

**Instructions to candidates:**

1. Answer **ALL** questions.
  2. Select the **BEST** answer to each question. Record your answers in the multiple-choice questions answer sheet provided.
  3. Programmable calculators and electronic dictionaries are **not** allowed to be used.
  4. Take  **$g = 10 \text{ m s}^{-2}$** .
  5. This paper consists of **11** pages.
-

1. Sulphur is \_\_\_\_\_.
  - a) a salt
  - b) a metal
  - c) a mixture
  - d) an element
  
2. Which of the following mixtures can be separated into its components by adding water, stirring and filtering?
  - a) sodium chloride and sand
  - b) zinc powder and copper filings
  - c) aluminium sulphate and copper sulphate
  - d) dilute hydrochloric acid and dilute sulphuric acid
  
3. What products are formed when sulphuric acid is added to sodium carbonate?
  - a) sodium sulphate and carbon dioxide
  - b) sodium sulphate, carbon dioxide and water
  - c) sodium oxide and carbon dioxide
  - d) sodium oxide, carbon dioxide and water
  
4. Which of the following is a chemical change?
  - a) freezing of water
  - b) dissolving of sugar in water
  - c) evaporation of water
  - d) corrosion of iron
  
5. Which of the following statements is true?
  - a) Alkalis will turn blue litmus red.
  - b) Alkalis react with metals to release hydrogen gas.
  - c) The pH of alkalis are greater than 7.
  - d) Alkalis are oxides of non-metals.
  
6. Which of the following metals is the most reactive with water?
  - a) calcium
  - b) copper
  - c) iron
  - d) lead
  
7. Which of the following oxides reacts with both hydrochloric acid and sodium hydroxide?
  - a) copper(II) oxide
  - b) potassium oxide
  - c) calcium oxide
  - d) lead(II) oxide

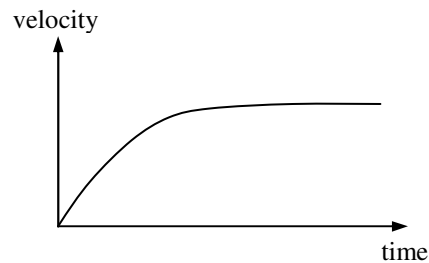
8. Which instrument should be used to measure lengths of about 1 mm to 10 cm?

- a) ruler
- b) measuring tape
- c) vernier callipers
- d) micrometer screw gauge

9. A density of  $1 \text{ g cm}^{-3}$  is the same as \_\_\_\_\_  $\text{kg m}^{-3}$ .

- a) 1
- b) 10
- c) 100
- d) 1000

10. The diagram shows the velocity-time graph of a car. The car \_\_\_\_\_.



- a) decelerated to rest
- b) decelerated to a constant velocity
- c) accelerated at an increasing rate
- d) accelerated to a constant velocity

11. When a car accelerates up a hill, it \_\_\_\_\_.

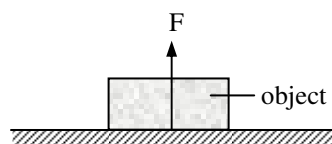
- a) gains both kinetic and potential energy
- b) loses both kinetic and potential energy.
- c) gains kinetic energy but loses potential energy
- d) gains potential energy but loses kinetic energy

12. A force of 100 N moved an object by 5 m. The work done is \_\_\_\_\_.

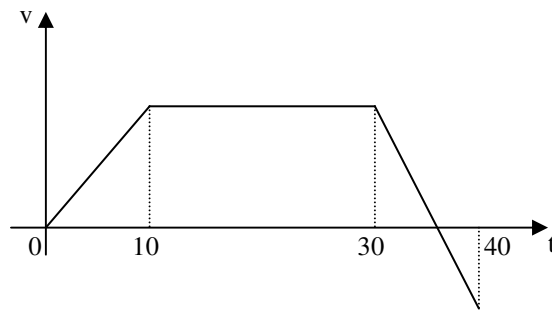
- a) 20 J
- b) 500 J
- c) 20 kJ
- d) 500 kJ

13. In the diagram below, the force (F) is known as \_\_\_\_\_.

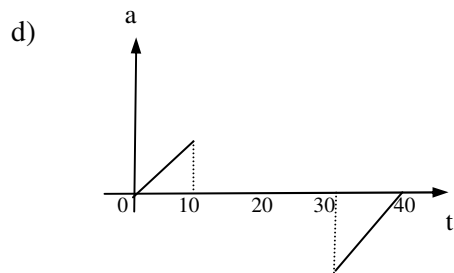
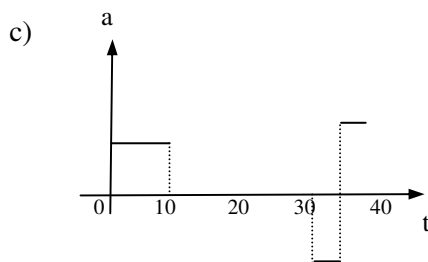
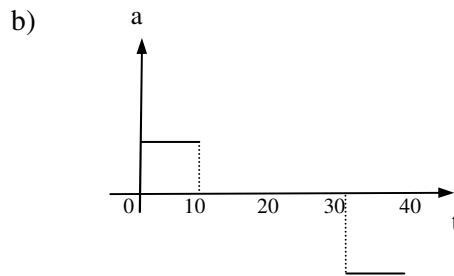
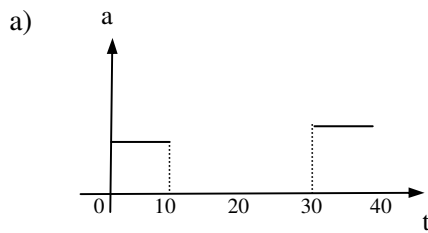
- a) compression
- b) friction
- c) reaction
- d) tension



14. The velocity-time graph of a car travelling along a straight horizontal road is shown below.



Which of the following graphs shows the acceleration  $a$  of the car with time  $t$ ?

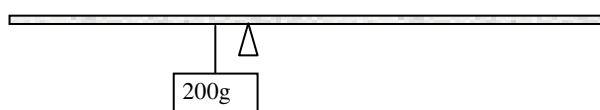


15. A man of weight 600 N runs up a flight of stairs of vertical height 7 m in 10 s. The output power of the man is \_\_\_\_\_ W.

- a)  $\frac{600 \times 7}{10}$   
 b)  $\frac{600 \times 10}{7}$   
 c)  $\frac{600}{7 \times 10}$   
 d)  $700 \times 10 \times 7$

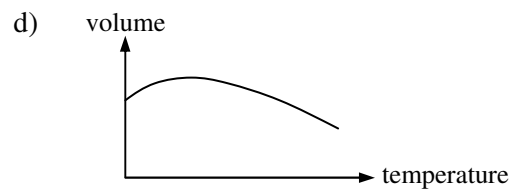
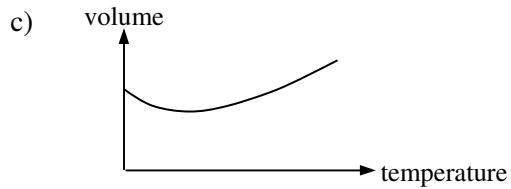
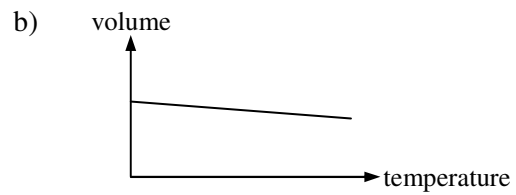
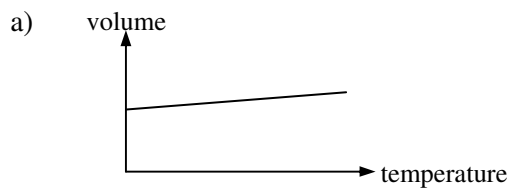
16. A uniform metre rule pivoted at the 40 cm mark is kept in a horizontal position by a mass of 200 g hung at the 35 cm mark. The mass of the metre rule is \_\_\_\_\_ g.

- a) 75  
 b) 100  
 c) 175  
 d) 200



17. The stability of a cone can be increased by \_\_\_\_\_ its base area and \_\_\_\_\_ the height.
- a) decreasing                      decreasing
  - b) decreasing                      increasing
  - c) increasing                      decreasing
  - d) increasing                      increasing
18. A force acting on a mass produces an acceleration of  $a$ . If the force is doubled, the acceleration of the object will be \_\_\_\_\_.
- a) reduced by a quarter
  - b) reduced by half
  - c) increased by a factor of two
  - d) increased by a factor of four
19. What is the water pressure at the base of a reservoir if the water is 200 m deep?
- a) 20.6 atm
  - b) 24.7 atm
  - c) 29.4 atm
  - d) 19.6 atm
20. When an iron rod is heated at one end for some time, the other end will become hot. This is an example of heat transfer by \_\_\_\_\_.
- a) conduction
  - b) convection
  - c) evaporation
  - d) radiation
21. During melting, the temperature of a substance \_\_\_\_\_ and heat is \_\_\_\_\_.
- a) increases                      given out
  - b) increases                      absorbed
  - c) remains unchanged              given out
  - d) remains unchanged              absorbed
22. 2 kg of copper is heated for 40 s by a 100 W heater. The temperature of the copper increases by \_\_\_\_\_. Given the specific heat capacity of copper is  $400 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ .
- a)  $5 \text{ }^\circ\text{C}$
  - b)  $10 \text{ }^\circ\text{C}$
  - c)  $20 \text{ }^\circ\text{C}$
  - d)  $50 \text{ }^\circ\text{C}$

23. Which of the following graphs shows the change in volume of water from 0 °C to 10 °C?



24. Which of the following is the most suitable for measuring rapidly changing temperature?

- a) clinical thermometer
- b) mercury-in-glass thermometer
- c) thermocouple thermometer
- d) alcohol-in-glass thermometer

25. A good absorber of heat is \_\_\_\_\_.

- a) a good radiator of heat
- b) a good reflector of heat
- c) a bad absorber of light
- d) a bad radiator of heat

26. Which one of the following is a longitudinal wave?

- a) visible light
- b) infra-red rays
- c) ripples on a water surface
- d) sound wave

27. Which one of the following lists is in decreasing order of wavelengths?

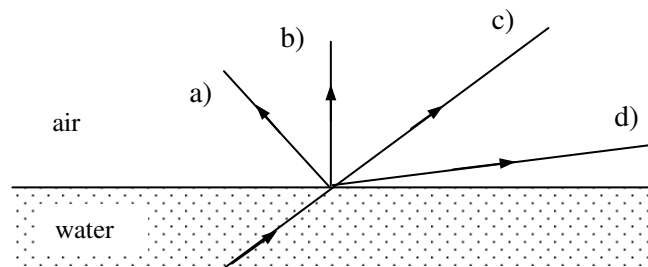
- a) visible light, radio waves, X-rays, infra-red rays
- b) radio waves, infra-red rays, visible light, X-rays
- c) X-rays, infra-red rays, visible light, radio waves
- d) infra-red rays, radio waves, visible light, X-rays

28. In which of the following media is the speed of sound fastest?

- a) concrete
- b) water
- c) oil
- d) air

29. What is the approximate human range of audible frequencies?
- a) 1 Hz to 20 Hz
  - b) 20 Hz to 20 kHz
  - c) 20 kHz to 200 kHz
  - d) 100 Hz to 5 kHz
30. Which of the following correctly describes the image formed in a plane mirror by an extended object?
- a) virtual and smaller than the object
  - b) virtual and same size as the object
  - c) real and larger than the object
  - d) real and same size as the object

31. A ray of light passes from water to air. Which line shows the direction of the ray after emerging from the water?



32. A man standing 330 m from a cliff fires a pistol. If he hears an echo 2.0 s later, what is the speed of sound in air?
- a)  $82.5 \text{ m s}^{-1}$
  - b)  $165 \text{ m s}^{-1}$
  - c)  $330 \text{ m s}^{-1}$
  - d)  $660 \text{ m s}^{-1}$
33. What is the smallest total resistance which can be obtained using only a  $6 \Omega$  resistor and a  $12 \Omega$  resistor?
- a)  $18 \Omega$
  - b)  $6 \Omega$
  - c)  $4 \Omega$
  - d)  $0.25 \Omega$
34. A 2 m long conductor has a resistance of  $50 \Omega$  and a cross-sectional area of  $1.5 \times 10^{-7} \text{ m}^2$ . What is the resistivity of the conductor?
- a)  $1.505 \times 10^{-5} \Omega \text{ m}$
  - b)  $3.755 \times 10^{-6} \Omega \text{ m}$
  - c)  $6.005 \times 10^{-9} \Omega \text{ m}$
  - d)  $6.675 \times 10^8 \Omega \text{ m}$

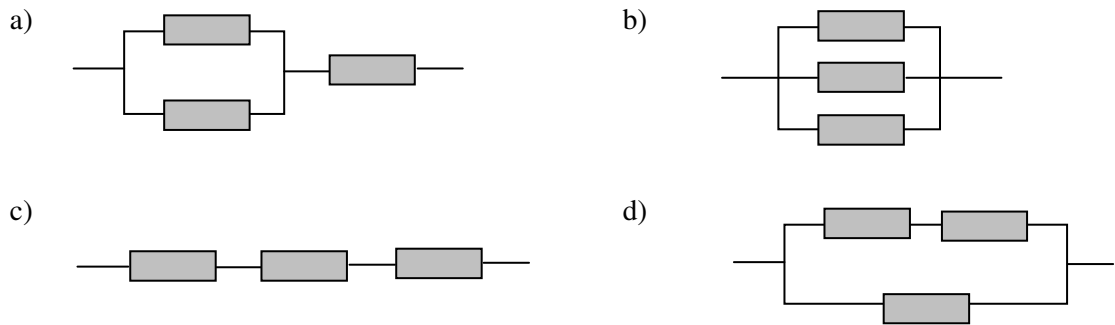
35. A copper wire carries a current of 5 A. What is the quantity of charge that flows in the wire in 1 minute?

- a) 300 C
- b) 12 C
- c) 5 C
- d) 0.083 C

36. A 3 W light bulb will remain lighted for \_\_\_\_\_ minutes if it is connected to a cell which can deliver 7200 J of energy.

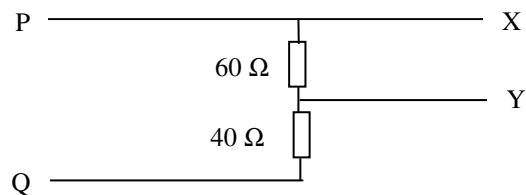
- a) 40
- b) 360
- c) 2400
- d) 21600

37. Given three  $20\ \Omega$  resistors, which of the following combinations has the lowest total resistance?



38. In the diagram below, the potential difference between P and Q is 20 V. What is the potential difference between X and Y?

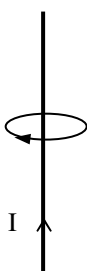
- a) 20 V
- b) 12 V
- c) 8 V
- d) 6 V



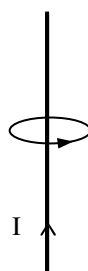
39. The cost of operating a machine rated at 1500 W, 8 hours daily, for 30 days is \_\_\_\_\_. Take the cost of electricity as \$0.20 per kilowatt-hour (kWh)

- a) \$0.24
- b) \$1.80
- c) \$7.20
- d) \$72.00

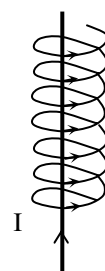


40. Which of the following statements about a fuse is correct?
- A fuse will blow when the current exceeds the safe value.
  - A fuse can control the voltage so as not to exceed the safe value.
  - A fuse will reduce the current if the current exceeds the safe value.
  - A fuse can be replaced with a piece of copper wire when it blows.
41. Which of the following metals can be used to make permanent magnets?
- aluminium
  - steel
  - soft iron
  - copper
42. A piece of metal bar is a magnet if \_\_\_\_\_.
- it does not attract iron filings when heated to a high temperature
  - a copper needle is attracted to it
  - one end of a compass needle is repelled by one end of the bar
  - both end of a compass needle are attracted to the same end of the bar
43. Which of the following involves induced magnetism?
- Two north poles repel each other.
  - A bar magnet attracts a piece of soft iron.
  - A bar magnet loses its magnetism when struck repeatedly.
  - A freely suspended bar magnet comes to rest pointing north-south.
44. Which of the following correctly shows the magnetic field produced by an electric current in a straight wire? Note that the lower half of the circle in a) and b) are in front of the wires.
- 

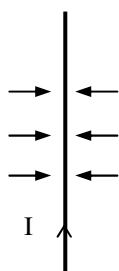
a)



b)

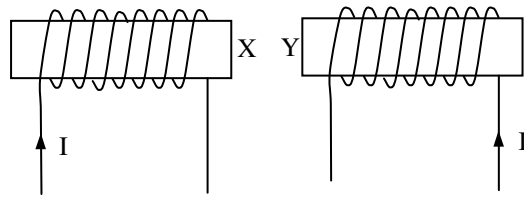


c)



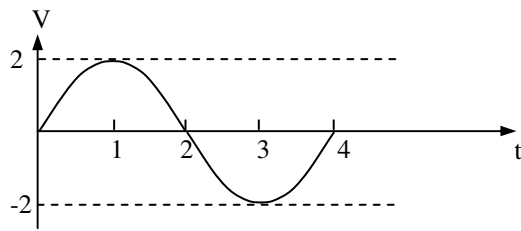
d)
45. The core of a transformer links the primary coil to the secondary coil. What type of link is this?
- electrostatic
  - magnetic
  - mechanical
  - thermal

46. Two pieces of soft iron are coiled as shown. If  $I$  is the current passing through each of the coils, which of the following gives the correct polarity of X and Y?

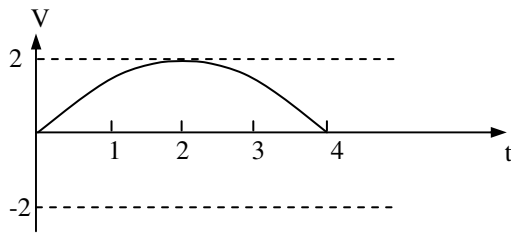


- |    |          |          |
|----|----------|----------|
|    | <u>X</u> | <u>Y</u> |
| a) | North    | South    |
| b) | South    | North    |
| c) | South    | South    |
| d) | North    | North    |
47. Which of the following changes will increase the amplitude of the e.m.f. produced by a simple generator of electricity?
- 1) Increase the number of turns in the armature coil
  - 2) Use a soft iron armature
  - 3) Increase the speed of rotation
  - 4) Use a stronger magnet
- a) 1 only
  - b) 1 and 2
  - c) 1, 2 and 3
  - d) All of the above
48. A straight wire is placed between the poles of a magnet. How should the wire be moved to produce the greatest induced current in the wire?
- a) downward and quickly
  - b) upwards and slowly
  - c) towards the magnet's poles and quickly
  - d) towards the magnet's poles and slowly

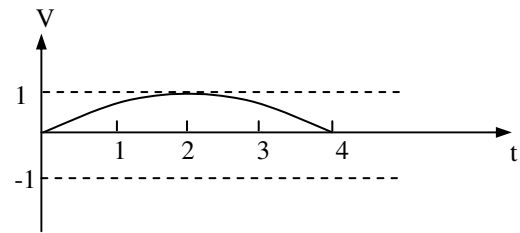
49. A simple a.c. generator produces a voltage which varies with time as shown in the diagram.



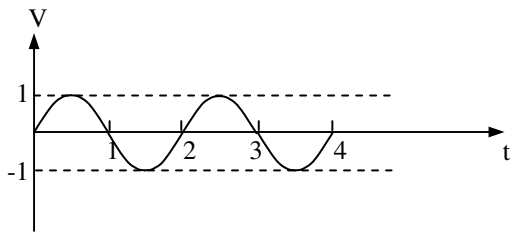
Which graph shows how the voltage varies with time when the speed of rotation is halved?



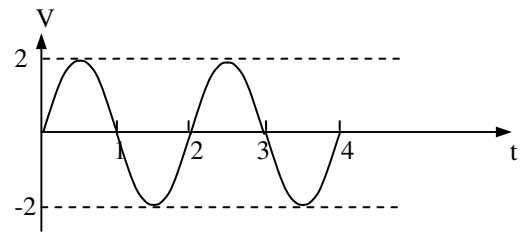
a)



b)



c)



d)

50. A transformer with a 1000 turns primary coil and a 100 turns secondary coil is referred to as a \_\_\_\_\_.

- a) 1000 turns step-up transformer
- b) 1000 turns step-down transformer
- c) 10:1 step-up transformer
- d) 10:1 step-down transformer