

Name of the Student: _____

Max. Marks : 24 Marks

Time : 24 Minutes

Mark Schemes

Q1.

(a) $320 \text{ MHz} = 3.2 \times 10^8 \text{ Hz}$

allow 320 000 000

1

$3.0 \times 10^8 = 3.2 \times 10^8 \times \lambda$

this mark may be awarded if frequency is incorrectly/not converted

1

$$\lambda = \frac{3.0 \times 10^8}{3.2 \times 10^8}$$

this mark may be awarded if frequency is incorrectly/not converted

1

wavelength = 0.9375

*allow correct calculation using an incorrectly/not converted frequency**allow an answer that rounds to 0.94*

1

metres **or** m

1

(b) (alternating) current induced (in the electrical circuit)*allow electrons vibrate / oscillate (in the electrical circuit)*

1

with the same frequency as the radio wave

1

(c) Any **two** from:

- (radio waves are) transverse
allow sound waves are longitudinal
allow a description of transverse/longitudinal waves
- (radio waves) travel at a higher speed
- (radio waves) don't need a medium
allow (only) radio waves travel through a vacuum
- (radio waves are) electromagnetic
allow sound waves are mechanical

2

(d) accelerating

allow speeding up

1

(e) appropriate tangent drawn

1

correct reading from graph for change in distance and change in time (eg 5.6 (m) and 20 (s))

allow correct reading from their tangent for change in distance and change in time

1

gradient of tangent shown (eg 5.6/20)

allow correct gradient from their tangent

1

0.28 (m/s)

this answer only

allow 0.25 to 0.30 (m/s) if the tangent is appropriate

allow $2.8 / 20 = 0.14$ (m/s) for 1 mark

1

(f) $0.52^2 - 0.12^2 = 2 \times 0.04 \times s$

1

$$s = \frac{0.52^2 - 0.12^2}{2 \times 0.04}$$

1

$s = 3.2$ (m)

1

$0.48 = F \times 3.2$

this mark may be awarded if the displacement is incorrectly calculated

1

$$F = \frac{0.48}{3.2}$$

this mark may be awarded if the displacement is incorrectly calculated

1

$F = 0.15$ (N)

allow a correctly calculated F using and incorrectly calculated displacement

1

OR

Alternative method 1

$$t = \frac{0.52 - 0.12}{0.04} \quad (1)$$

$t = 10$ (s) (1)

$s = 0.32 \times 10$
 $= 3.2$ (m) (1)

allow a correctly calculated displacement from an incorrectly calculated t

$0.48 = F \times 3.2$ (1)

this mark may be awarded if the displacement is incorrectly calculated

$$F = \underline{0.48}$$

this mark may be awarded if the displacement is incorrectly calculated

$$F = 0.15 \text{ (N) (1)}$$

allow a correctly calculated F from incorrectly calculated values for displacement and / or t

OR

Alternative method 2

$$0.48 = (0.5 \times m \times 0.52^2) - (0.5 \times m \times 0.12^2) \text{ (1)}$$

$$0.48 = 0.1352m - 0.0072m \text{ (1)}$$

$$0.48 = 0.128m \text{ (1)}$$

$$m = 3.75 \text{ (1)}$$

$$F = 3.75 \times 0.040 \text{ (1)}$$

allow their calculated m

$$F = 0.15 \text{ (N) (1)}$$

allow correctly calculated F using an incorrectly calculated m

- (g) there is a maximum forward force (provided by the motor)
allow driving force for forward force - throughout
the car has a maximum acceleration is insufficient

1

as the speed of the car increases air resistance increases
allow friction / drag for air resistance - throughout

1

until air resistance is equal in size to forward force
allow (until) the resultant force is zero
allow forces are in equilibrium / balanced

1

so the car can no longer accelerate
allow the car travels at terminal velocity

1

[24]